DEC 6 1909

TELEPHONE ENGINEER

Vol. II CHICAGO, SEPTEMBER, 1909 No. 3

American Electrical Works

PHILLIPSDALE, R. I.

GALVANIZED TELEPHONE

WIRE

Siemens-Martin High Strength and Extra High Strength Galvanized Strands

Of Highest Quality

STOCKS AT

Phillipsdale, R. I. St. Louis, Mo. Syracuse, N. Y. Kansas City, Mo. Chicago, Ill. Dallas, Tex. Atlanta, Ga.

C. O. BAKER, Pres. C. W. BAKER, Vice-Pres.

Platinum

Platinum Wire, Sheet, Foil, Platinum Rivets and Contacts. Special forms made to specifications.

All of "Baker" Quality

Platinum Scrap Purchased

Write for Catalogue

BAKER & CO., Inc.

N. Y. Office: 30 Church St. NEWARK, N. J.

THE WIRE OF QUALITY

TELEPHONE WIRE

BEST BY EVERY TEST

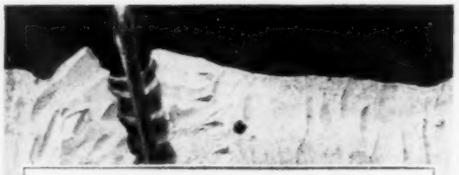
Dubbed by leading users Plain talk and long distance wire because of its superior quality

WRITE FOR FREE SAMPLE AND MAKE COMPARISON—BE CONVINCED

Handled by Leading Supply Houses or Sold Direct.

Indiana Steel & Wire Co.

MUNCIE—INDIANA



MATTHEWS' GUY ANCHORS

Screw into the solid undisturbed ground.

That is the reason for their great holding power and the fact that they don't creep.

They are made in one piece, therefore no possibility of burying unadjusted parts to arise like a ghost later. They stay put.

W. N. MATTHEWS & BROTHER

Manufacturers of Matthews' Patented Money Saving Specialties

229 NORTH SECOND ST., ST. LOUIS

If it is made by Matthews it must be a money saver

©CLB197368

TELEPHONE ENGINEER

VOL. II — CHICAGO, SEPTEMBER, 1909 — No. 3

PUBLISHED MONTHLY BY THE
ELECTRICITY MAGAZINE CORPORATION
MONADNOCK BUILDING, CHICAGO.
ED J. MOCK and PAUL H. WOODRUFF, Editors.

LONG DISTANCE TELEPHONE: HARRISON 3014.

EUROPEAN OFFICE.....36 Maiden Lane, Covent Garden, London
S. RENTELL & Co., Representatives.

Application made for entry as second-class matter at Chicago, Illinois, postoffice.

TERMS OF SUBSCRIPTION.

United States, Cuba and Mexico.....Per year, $2.00
Canada.....Per year, 2.50
Foreign countries within the Postal Union.....Per year, 3.00
Single Copy..... .20

DISTRIBUTING AGENTS: The Western News Company and its International Branches.

NOTICE TO ADVERTISERS.

Changes of advertising copy should reach the office of publication not less than ten days in advance of date of issue. Regular date of issue, the first day of each month. New advertisements will be accepted up to within five days of date of issue, but proof of such advertisements can not be shown until the appearance of the edition containing it.

NOTICE TO SUBSCRIBERS.

REMITTANCES.—Remittances should be made by check, New York draft or money order, in favor of TELEPHONE ENGINEER. Foreign subscriptions may be remitted direct by International Postal Money Order, or sent to our London office.

CHANGE OF ADDRESS.—The old address should be given as well as the new, and notice should be received two weeks in advance of the desired change.

DATE ON WRAPPER indicates the month at the end of which subscription expires. The sending of remittances for renewal prior to that date will be much appreciated by the publisher.

CLUB RATE.—In acknowledgment of assistance rendered by subscribers in the securing of new orders, a club rate of $1.50 per annum is quoted. This rate applies to subscriptions in clubs of two or more, which contemplate new subscribers.

Copyrighted, 1909, by ELECTRICITY MAGAZINE CORPORATION.

CHICAGO, SEPTEMBER, 1909.

TABLE OF CONTENTS.

Editorial 91-94
Laboratory Tests in Telephone Making. By G. A. Joy..... 95-97
Calculation of Inductance and Resistance..... -97
Big Shops of the Cumberland T. & T. Co. By Jos. H. Atchison.. 98-101
Columbus Company Makes Improvements..... 101-102
Egner-Holmstrom Telephone Apparatus..... 102
How to Read Telephone Circuit Diagrams. By David S. Hulfish.. 103-106
Pole Damage by Woodpeckers..... 106
What is the Matter? By J. C. Kelsey..... 107-108
California Franchise Decision..... 108
Items of Legal Interest. By Ralph M. Loring..... 109-110
Who's Who in the Telephone Game..... 111-112
Telephones in Brazil..... 112
Testing of Galvanized Iron. By M. E. Chester..... 113-115
Pledge of Courtesy..... 115
Railway Telephone Construction. By J. C. Kelsey..... 116-118
McMeen on Cable Corrosion..... 118
Recent Telephone Patents. By David S. Hulfish..... 119-120
Wood-Saving Processes..... 120
What Makes a Good Farmers' Telephone. By O. H. Livermore..... 121-122
New Exalted Order of Telephone Men..... 122
Instruction in Telephone Engineering. By G. S. Macomber..... 123-124
Wireless on Trains..... 124
Enterprising Independent Company. By Gifford Wheeling..... 125-126
Removal of Telephone Too Great Punishment..... 126
Of Interest to the Trade..... 127-131
Self-Restored Magneto Line Signal..... 127
Another American Invasion..... 128
An Interesting Exhibit..... 129
New Western Electric Quarters at Dallas..... 130
New Automatic Contract..... 130
Wasson Opening Canadian Factory..... 131
Brevities of the Business..... 132-134

BUSY LINES.

THE busy signal is responsible for a good many lost calls. On a single line, every outgoing call is the possible means of losing one or more incoming calls; and every incoming call received may prevent the reception of other incoming calls. Of these lost calls the subscriber can have no intimation, unless perchance the calling party later informs him of his unavailing efforts to get his number.

Since the greater the number of outgoing calls, the less the opportunity for incoming calls, the unlimited service line with its inevitable abuse of calling privileges is the greatest sufferer in this respect. There is a natural tendency to use the measured service line only for actually necessary calls, which gives incoming calls their maximum opportunity and produces a condition of maximum single-line efficiency.

Next to wrong number calls, the busy signal is the most exasperating feature of telephone service, from the user's point of view. Like wrong number calls, its reduction beyond a certain theoretical point is impossible—but for a different reason. The wrong number call persists because of a certain definite and inevitable percentage of human error; the proportion of busy calls is purely arithmetical, the interference of two calls among a given number being according to certain laws.

Since this feature of interference cannot be reduced beyond the point reached at maximum line efficiency, it must remain as a perpetual annoyance to telephone users unless some other method of regaining the lost calls can be devised. This would seem a difficult matter, because the loss of a call through the calling party getting the busy signal depends either on human caprice, which is hard to modify, or on time limitations which make it impracticable to repeat the call.

Of course it is possible and practicable to apprise the disappointed calling party as soon as the line he is calling is free; and in fact this is done in some places. But it must be admitted that where service must reach a very high efficiency this is a complicated procedure, necessitating the making of mnemonic records which cannot but be uneconomical.

The keeping of busy-test records, however, is followed to a considerable extent for the preparation of data on over-worked lines, and for use in soliciting extra service. In no case does the subscriber see this record until he is considered ripe for a second line or a private branch exchange board. At such time, when confronted with the evidence of so many calls lost forever, he doubtless is quite amazed, and feels considerable wonder as to the nature of the messages that "died aborning."

The keeping of a busy-test record is neither difficult nor expensive. Its usefulness as a check on conditions of service is considerable, and may be greatly in-

creased by practical co-operation with the subscriber. It would not be impracticable to furnish flat-rate subscribers with monthly records of busy calls on their lines; and this information properly applied would help much in relieving the congestion which so frequently obtains on unlimited service lines. The subscriber will be more chary of his unnecessary calls if the fact is brought home to him that he is depriving himself of incoming messages.

This system would be as applicable, of course, to measured service as to flat-rate lines. But, as previously explained, measured service tends to be self-regulating to a great extent; while, on the other hand, the operating company has a direct interest in cutting down the number of calls on flat-rate lines. The merits of the system would be more quickly apparent in connection with the control of unlimited service.

By going a step further, the record can be made to show at what time of the day the busy calls are most frequent, enabling the subscriber to regulate his own calls accordingly, with a resulting tendency to distribute the peak load, to a slight extent at least.

Of course this suggested remedy for some of the busy-call evils operates rather indirectly. There is no direct cure except the expensive supervision which provides a report back to the calling party when the line is clear. The only alternative, to report to the called party what number called him while his line was busy, would hardly be more economical; although such a system may possibly be worked out some day by some of our enterprising systematizers.

But the plain busy-call report is practical; and, indefinite as it is, the information it contains can be used to benefit the subscriber, and, through him, the operating company.

THRASHING IN IOWA.

AFTER the harvest comes the thrashing. Last month we referred to the Iowa harvest, alleging that some independent telephone operators were concerned when an "amicable arrangenent" affecting the northeastern quarter of the state had been negotiated with the Bell. We offered some consolation to the rest of the state, because it seemed that a delivery so momentous would not shortly be succeeded by something even more startling. But the harvest, however large, had some surprises for thrashers. Now comes the word that a wide swath of independent systems including much territory immediately west of the last section involved, has by purchase and other agreements been taken over by the Iowa Telephone Company.

The hub of the Hawkeye state, Des Moines, wherein operated the Mutual Company, has been surrendered. The deal was "engineered" by Casper H. Yost, for the Bell, and the Brenton Bros., controlling spirits of the Mutual. The consideration is put down at more than half a million dollars.

Out in Iowa the Brenton boys—Clyde and Charley—have been heavy investors in telephone securities. They are large realty holders and bankers at Dallas Center. They were interested in the telephone business, because it was presented to them wrong end to. It promised too much, but having got their feet wet, and being game, they stuck until a time offered to "duck," when they slid out.

The Mutual was capitalized at $1,600,000. It is claimed to be worth $1,100,000. There were three exchanges in the city serving nearly 8,000 subscribers. Press reports allege that through the Mutual and Hawkeye, a quarter of a million independent stations were being served.

The Bell invasion of Iowa is becoming significant. In the systems it has purchased outright during the past sixty days is all kinds of apparatus—manual, selective, automatic. There are presented many unique problems, but the chief motive is to eleminate competition of a harmful nature. The independent operator may promote his own enterprise as he sees fit. He will buy apparatus that best serves his purpose. He is not obliged to buy a particular make. For once in his business career he need not be harassed by any opponent. If he charges a reasonable rate that leaves him a profit he will be able to render good service and make needful extensions. Duplicated plants in the cities will be cut into a single system. Economies will follow.

The great test will come when the people have had time to declare themselves. If the mergers will satisfy the public, then the independent promoter of other systems in the same territory will either invent some new arguments or depend upon a new scheme of speech transmission that hasn't yet been invented.

ELECTRICAL COMMUNICATION.

THE third census of telegraph systems of the United States has just been issued as Census Bulletin 102, prepared by William M. Steuart, chief statistician for manufacturers under the direction of E. Dana Durand, census director.

For census purposes the telegraph industry of the country is divided into five classes, as follows: Commercial telegraph and ocean cable, wireless telegraph, railroad telegraph, government telegraph, and municipal fire alarm and police patrol signaling systems.

The report shows that more than fifteen million miles of single wire are used by the people of the United States in communicating with each other over the various telegraph and telephone systems. Of this number, 12,999,369 miles are operated by telephone companies. It is interesting to note that the census of 1889 showed a total telephone mileage of 34,305. Of the total telephone wire mileage of 1907, 5,092,223 were on pole or roof lines, 2,917,114 in overhead cables, 4,969,302 in conduits or subways, and 20,730 in submarine cables.

A comparative summary deals with the telephone and commercial telegraph systems, not including railroad lines and the wireless, giving the grand total as 22,996 companies, of which there are 22,971 telephone systems, which include 17,702 independent farmer or rural lines, and 25 commercial telegraph systems, not including the wireless. The grand total of single wire mileage was 14,570,142, of which the telephone systems controlled 12,999,369 miles, which include 486,294 miles of wire on independent farmer or rural lines, while the telegraph systems used 1,570,773 miles, exclusive of 7,188 miles of leased wire.

The grand total of ocean cable was 46,301 nautical miles, all controlled by the commercial telegraph systems.

The grand total of salaried officials, clerks, etc., was 29,470, of whom 25,298 were employed by the telephone systems and 4,172 by the commercial telegraph. The telephone officials, etc., received in salaries $19,298,423 and the telegraph clerks $2,794,937. The total of 142,733 wage-earners is divided, 118,871 belonging to

the telephone systems and receiving in wages $48,980,704, while the 23,862 telegraph wage-earners were paid $15,013,312.

The grand total of capital stock and bonds outstanding, par value, was $1,034,909,579, of which $814,616,004 were credited to the telephone systems and $220,293,575 to the telegraph companies.

The grand total income was $236,045,615, of which the telephone concerns earned $184,461,747, expending $140,802,305, and the telegraph system earned $51,583,868, expending $41,879,613. Of the whole number of systems in operation, the telephone formed 99.9 per cent.

There were six commercial wireless telegraph systems, having 122 tower stations in 1907, situated at most of the large ports on the Atlantic and Pacific oceans, the Gulf of Mexico, the Great Lakes and in Hawaii. Wireless messages to the number of 163,617 were sent between these ports in 1907. These six companies had an authorized capitalization in the form of stock with a par value of $39,450,000 of which $32,726,242 was the value of outstanding stock. The year's income was $122,154, and the expenses $169,782, of which $87,571 was expended in the salaries and wages of 182 employes.

It is pointed out that the federal government has realized the value of wireless telegraphy, and the Bureau of Equipment in the Navy Department, at the end of the fiscal year 1907, had installed wireless telegraph apparatus on 73 naval vessels and at 44 shore stations. During that period the shore stations sent 26,933 messages, containing 541,919 words, and received 34,073 messages, amounting to 675,607 words. Cape Cod, Mass., led all stations in this respect, sending 2,673 messages, and Cavite, in the Philippine Islands, came next, sending 2,025 messages. Of the number of stations receiving messages, Dry Tortugas, Fla., had 2,703; Newport, R. I., 2,701; Mare Island, Cal., 2,334; Cape Cod, Mass., 2,304; Norfolk, Va., 2,171, and Cavite, P. I., 2,013. The shore stations are open to the public for messages, and these are also received from or put on the telephone or telegraph land lines.

It is shown that in 1907 the railroad systems in the United States operated 807,824 miles of telegraph wire, 52,518 mile of telephone wire, and employed 68,197 telegraph operators and dispatchers, who received $37,242,479 in salaries and wages. These systems reported 33,441 telegraph offices and 30,115 telephones; transmitted 5,923,483 commercial messages and 258,589,333 messages in connection with the dispatching of trains and other railroad business. The bulletin states the presumption that the telephone will come into more general use for train dispatching, as during 1908 two conventions of railway telegraph superintendents heard reports that the telephone would appear to be as safe as, if not safer than, the use of the telegraph, and that the telephone actually expedited train movements because of its greater speed and flexibility. Referring to the electric interurban roads, the bulletin notes that they early recognized the advantages of the telephone for dispatching purposes.

Going into comparisons between the statistics of the 25 commercial land lines and ocean cable telegraph systems and of the telephone systems, the bulletin refers to the fact that the first telegraph line in the United States was opened for business in 1844, and thirty-two years later the telephone was introduced. At the 1889 census the telephone companies reported 34,305 miles of wire, about one-ninth of the mileage of the telegraph companies. In 1902 the telephone mileage of wire was almost four times as great as that used for telegraph purposes. In 1907 the telephone mileage was eight times as great as the telegraph.

In the amount of business done, the sum paid in salaries and wages, and the capital invested in 1907, the telephone business was a little over three and one-half times as extensive as the telegraph industry, and during that year it furnished employment for more than five times as many persons.

Between 1902 and 1907 there was an addition of 8,098,918 miles of wire for the use of the telephone systems, as compared with an increase of but 259,611 in the mileage of owned and leased wire for commercial telegraph purposes. The increase in the wire mileage of the telephone systems during the five years referred to was more than six times as great as the total amount of wire added to the telegraph business of since 1880.

NIAGARA FALLS CONFERENCE.

THERE is to be a gathering of independent clans at Niagara Falls, September 4, 5, and 6. A call emanating from International Headquarters is to that effect, but so far as we can learn it was directed to an exclusive circle beyond the advisory board and executive committee. There is promise of something unusual in the gathering. Large independent operating interests will be represented. Some of the manufacturers will go. The general inference is that something is needed that will more suitably perform the functions of a central organization of information than the present plan affords. The International association has never been quite so efficient as it was when Jas. B. Hoge took it off to Cleveland, dug deep into his pocket and personally superintended its action. This is not meant as a reflection upon his successors, who may have labored under some handicap that Mr. Hoge did not have to contend with.

The importance of having a general headquarters for independents and their interests need not be argued. The maintenance of the present makeshift has ever been a difficult problem. In the past, the sinews of war have been largely contributed by the independent telephone manufacturers. That this scheme is illogical has long been understood. The function of the International association is to aid the operators of telephone systems. It should receive the united support of these operators. The manufacturer of telephone apparatus is scarcely indirectly benefited. He might become an auxiliary, but should have no further interest. The old stamp-act offered some relief to the association, but it was abused by the manufacturers. The direct assessment, still in vogue, brings some money, but not enough to accomplish much beyond the expenses of one man on the job. In many cases the assessment was unjust—the small manufacturer having to pay out of all proportion to the large manufacturer.

The independent telephone business, if it is to successfully cope with its rival, the Bell companies, will do well to adopt as its slogan the time-worn expression of that adversary, viz.: "Success is dependent upon the ability of a telephone company to give its subscribers ample means of communication, not only in their own community, but with other communities more or less distant."

Independents are claimists if nothing else—at convention times. If the competitive contest is to continue,

it will make some progress when independents practice in the field what they openly declare in convention. There should be a strong, vigorous central body, to have its several departments, managed by an executive who understands the disbursing of large funds to enhance the welfare of all. There is much need for a legal department; more need for an advertising campaign.

Throughout the development, the National or International association has been more of an object of pity than anything else. It may have had notions to accomplish much, but being a poor, starved thing, without united co-operation and ample funds it could do little. Men who have accepted the honors of its offices have generally passed on with anathemas instead of anthems. It has been a thankless task—a mean occupation. It can be made the most vital of all independent institutions, but it will require money and lots of it. This money should all be provided by the independent operators of the United States and Canada. It should come easily—a tax of ten cents per station for one day in the year, or five cents for two days in the year would create an enormous fund. Its proper disbursement would insure the multiplied return of the amount in diverse ways, providing it was placed in the hands of an earnest executive who had in his heart the whole welfare of his constituents and their undivided and enthusiastic co-operation.

We anticipate that the Niagara Falls conference will signalize a new era for organization along broad lines. It will mean something more than a discussion of plans for the next annual convention.

THE NEW TARIFF.

THERE are several slight changes in the tariff under the new law which are of interest to the telephone trade. Copper remains unchanged, paragraph 174 reading:

> Copper-plates, rolled, called brazier's copper, sheets, rods, pipes, and copper bottoms, 2½ cents per lb.
>
> Sheathing, or yellow metal, of which copper is the component material of chief value, and not composed wholly or in part of iron, ungalvanized, 2 cents per lb.

Paragraph 536 reads:

> Copper ore: regulus of, and block or coarse copper, and copper cement; old copper, fit only for remanufacture, clippings from new copper, and copper in plates, bars, ingots, or pigs, not manufactured or specially provided for in this section, free.

The paragraph on wire, No. 134, reads as follows:

> Round iron or steel wire, not smaller than No. 13 wire gauge, lbs., 1 cent per lb.
>
> Smaller than No. 13 and not smaller than No. 16 wire gauge, 1¼ cents per lb.
>
> Smaller than No. 16 wire gauge, lbs., 1¾cents per lb.
>
> But not less than 35 per cent on any of foregoing, 35 per cent.
>
> All wire of iron or steel or other metal except gold or silver, covered with cotton, silk, or other material, corset clasps, corset steels, dress steels, and all flat wires and steel in strips not thicker than No. 15 gauge and not exceeding five inches in width, and all wire not specially provided for, 35 per cent.
>
> Iron and steel wire coated by dipping or galvanizing, 2-10 cents per lb. in addition to rate on wire of which made.
>
> Articles manufactured wholly or in chief value of any wires provided for in this paragraph pay maximum rate on any wire used in their manufacture and 1 cent per lb. in addition.
>
> No article made or composed of wire to pay less than 40 per cent.
>
> Telegraph, telephone, and other wires and cables composed of metal and rubber, or of metal, rubber and other materials, 40 per cent.
>
> Barbed fence wire, ¼ cent per lb.
>
> Wire heddles, 25 cents M, and 40 per cent.

Paragraph 200 reads:

> Paving posts, railroad ties, and telephone, trolley, electric-light, and telegraph poles of cedar or other woods, 10 per cent.

The old rate was 20 per cent.

Manufactures of vulcanized or hard rubber are dutiable at 35 per cent ad valorem under paragraph 456, thus remaining unchanged.

Telephone and other instruments, apparatus and machinery will come under the provisions of paragraph 195 by assimilation, which is exactly the same as paragraph 193 of the Dingley act, providing for

> Articles or wares not specially provided for in this section, composed wholly or in part of iron, steel, lead, copper, nickel, pewter, zinc, gold, silver, platinum, aluminum, or other metal, and whether wholly or partly manufactured, 45 per cent ad valorem.

The new schedule covering mica is: For unmanufactured mica, or rough trimmed only, 5 cents per pound and 20 per cent ad valorem; for mica cut or trimmed, mica plates or built-up mica and all manufactures of mica, 10 cents per pound and 20 per cent ad valorem. Under the Dingley law, uncut mica was 6 cents per pound and 20 per cent ad valorem, and manufactured mica was 12 cents per pound and 20 per cent ad valorem.

Lead in bars and pigs pays a duty under the new law of 2⅛ cents per pound, the same as under the Dingley law, while lead in sheets pays 2⅜ cents per pound as compared with 2½ cents at the present time.

Red lead and litharge are taxed under the new law at 2⅝ cents per pound. This is not only a slight reduction, but unifies the rate on the two materials. Under the Dingley law red lead paid a duty of 2⅞ cents per pound and litharge 2¾ cents.

Zinc has had a slight reduction of duty. Under the new law in blocks or pigs the tax will be 1⅜ cents per pound as against 1½ cents under the present law, while zinc in sheets will be 1⅝ cents per pound compared with 2 cents under the present law.

THE PRIZE CONTEST.

TELEPHONE ENGINEERS' contest for the betterment of social conditions between telephone users is closed. In the contest editor's desk is a great mass of unread manuscript, awaiting the careful deliberation and decision of the judges. Soon the prizes will be awarded to the winners—$50 to the best, $25 to the second, $15 to the third, $10 to the fourth, and probably space rates to a number of others, if enough be found to possess merit.

That last clause is not intended as a reflection on the ability of our contestants. We have admitted before that the subject was a difficult one—as difficult, in some ways, as any that could be assigned. But we hope for great things from this contest. Even after the prizes have been distributed and the articles printed and forgotten; the impetus has been given, and the thought will go rolling on—until some fine morning we shall find that our telephonic correspondent bids us greeting in so pleasant a manner that we shall know the telephone millennium is come. The ball has started rolling; and in this vigorous, virile country of ours it never stops, once started.

This giving of prizes is not all gaiety, either. So many are disappointed; so many almost succeed. But, as in everything else, all cannot win. Those who do will well deserve it, for they must have given their best to the subject before them. Here's to the winners!

Laboratory Tests in Telephone Making

By G. A. Joy

THE one important point in the building of telephone apparatus is to know beforehand exactly what it will do when completed. This necessarily means that the builder must know the characteristics of the component parts. First, he must know that the raw material—copper, steel, iron and what not—must be adapted to the work required of it. The parts must be assembled so as to produce the best results. All these points must be carefully studied to ascertain the combination that will produce the best results. This is the field of work for which the testing laboratory is intended.

All manufacturers of any note, of telephone or other electrical apparatus, are provided with some kind of testing equipment. Generally the testing instruments consist of voltmeters, ammeters, bridges and similar ap-

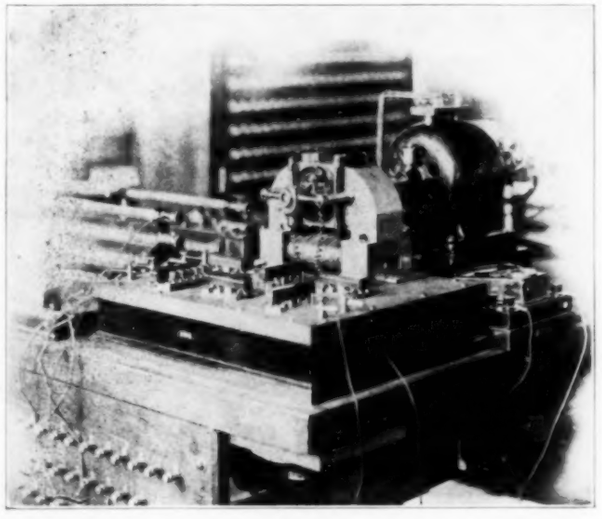


Fig. 1.

paratus. While these are essential, the laboratory of an up-to-date factory should contain instruments with which tests of the raw material, that goes into the shop, can be readily made to ascertain if it is suitable for the work for which it is intended. For instance, at the present time not all manufacturers of telephone apparatus are able to determine the quality of the magnet steel that goes into the various pieces of their apparatus. They are at the mercy of the manufacturer and are furnished, possibly not intentionally, steel of a grade that is not suited for the work for which it is intended. The material is used and is tried out under actual working conditions. This is a slow and expensive process, and as most magnets, even if made from a poor grade of steel, will retain their magnetism for a certain length of time, thus allowing the manufacturer to place his equipment with the users who in turn will find, after a time, that the apparatus fails to operate satisfactorily.

It has been but a few years since we were enabled to ascertain with any accuracy or ease the current or voltage wave forms of an ordinary alternating current dynamo; but now with the aid of the oscillograph we are able to get accurate diagrams or to be more precise, to actually photograph the wave form of the most complicated shape. With a dynamometer the slightest current and voltage can be accurately measured; and with the permeameter the various magnetic characteristics of all grades of iron or steel can be accurately determined.

Telephone apparatus is expected to work under all

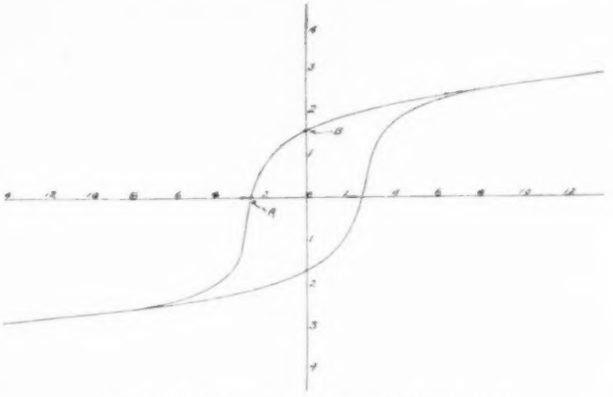


Fig. 2. Hysteresis Curve, Generator Magnet Steel.

kinds of conditions, and this cannot be accomplished except where the equipment is properly designed and constructed of the right kinds of material.

Practically every piece of telephone apparatus has in some part of its construction, iron or steel which is electrically or permanently magnetized. Iron is used in the construction of electrical apparatus because it is the best conductor of magnetism, and is by far the cheap-

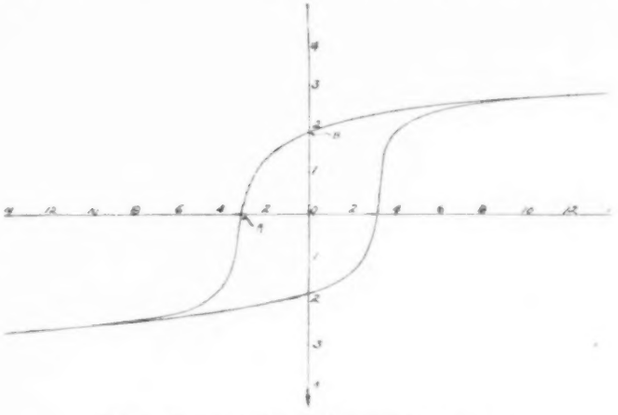


Fig. 3. Hysteresis Curve, Generator Magnet Steel.

est of all magnetic materials. There is a great difference in the magnetic quality of different kinds of iron and, moreover, steels which have the same physical and chemical characteristics often differ greatly in their magnetic qualities.

Manufacturers of electrical apparatus try to obtain iron of the best magnetic quality in order to make the magnetic conductors as small as possible, thereby re-

ducing the weight of iron and also the amount of copper wire necessary to produce the required magnetism. It is also desirable to obtain iron of uniform magnetic quality in order that the operation of the apparatus may be accurately predetermined, and so that a number of pieces, when made at the same time or different times, will test out alike.

Since the quality of iron is important and the mag-

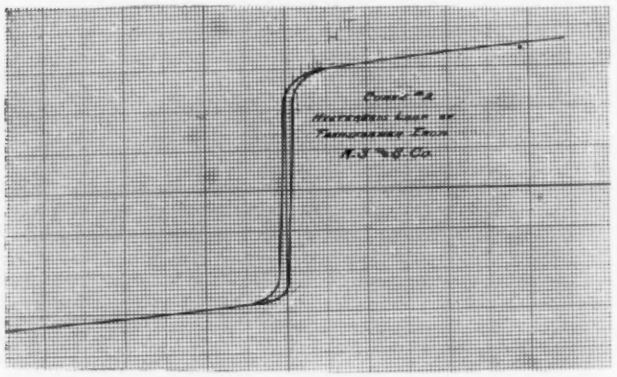


Fig. 4.

netic properties of iron produced by the same manufacturers vary considerably, it is desirable, in fact almost absolutely necessary, that the manufacturers of electrical apparatus make frequent tests of the iron used; for by so doing they are enabled to gain an advantage which comes from the manufacture of good uniform apparatus.

The magnetic testing of iron by the scientific laboratory method is slow, laborious and requires the skill of a person trained in this work, if accurate results are to be obtained. The apparatus generally used is delicate, likely to get out of order, subject to errors due to vibrations and is easily affected by stray magnetic fields

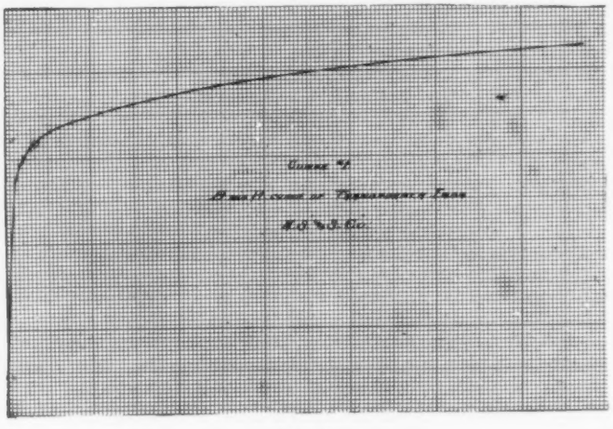


Fig. 5.

and the calculation of the results are consequently of questionable value.

The permeameter shown in Fig. 1 is an instrument designed for commercial work, and with it one can determine, with a high degree of accuracy, the magnetic characteristics of iron and steel with but little work.

Steel used for generator or other types of permament magnets must have the quality of retaining its magnetism. To determine the suitability of a given grade of steel, a sample is submitted to the laboratory, a test made and a curve plotted showing graphically the results obtained. The curves shown in Figs. 2 and 3 are what are known as hysteresis curves, and reveal the amount of magnetism retained by the steel and also the force with which it is retained. The distance O to A represents the retaining or coercive force of the steel, while the distance O to B represents the amount of magnetism retained or the residual density. The steel from which the curve in Fig. 2 was made has a greater coercive force and retains more magnetism than the steel used in making the curve shown in Fig. 3.

In Fig. 4 is shown a hysteresis curve of a good grade of soft iron such as is used in the core of a pole changer transformer coil. It will be noted that the curve is very narrow, indicating that the iron has very little power to retain magnetism. This is the character of the curve of a grade of iron that is suitable for the cores of induction coils, retardation coils and apparatus of this nature. To be able to produce a curve of this kind, the iron must be thoroughly annealed.

The curve shown in Fig. 5 is what is known as the B and H curve, and indicates the high density of mag-

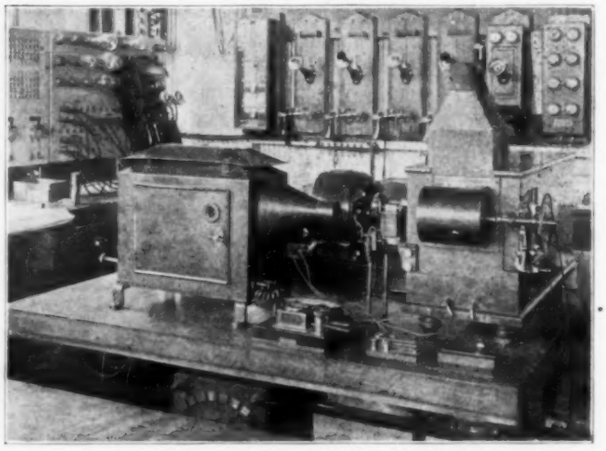


Fig. 6.

netic lines of force for a small magnetizing force. This curve was taken from the same piece of iron that was used in making the hysteresis curve shown in Fig. 4.

Whenever a new shipment of steel or iron has been received, samples are taken at random and submitted to the laboratory, and if they do not come up to the standard specified, the whole shipment is rejected. It has been found by the Kellogg Switchboard and Supply Company, which has been using a permeameter for several years to test its iron and steel, that it has been able to greatly improve its apparatus in many respects; and that by rejecting several shipments of steel, which upon test did not come up to its standard, the subsequent shipments have more than fulfilled the specifications.

Another instrument which is of great importance in a testing laboratory is the oscillograph shown in Fig. 6. This figure also shows a corner of the Kellogg company's laboratory. The oscillograph is used in studying voltage and current wave forms. By a careful study of these waves the apparatus can be so designed as to produce the proper shape of wave to give the best results.

In the study of a magneto generator the wave forms are carefully examined under all conditions, such as open circuit on bridged and series lines and on lines with and without condensers in the bell circuits, etc. While a generator might be satisfactory for one class of service, it will not always operate successfully under other conditions. By means of the oscillograph one is able to compare and study the shape of the waves, and thereby design a generator which will operate satisfactorily under all conditions.

The oscillograms shown in Fig. 7 were taken from an ordinary hand generator under two different operating conditions, and it will be noted that the form of the waves are decidedly different. The smooth heavy wave in each represents the voltage and the sharp pointed one the current. By having the one superimposed upon the

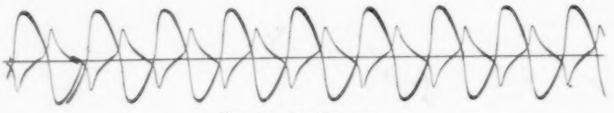


Fig. 7 Oscillograms.

other, a study of the relation existing between the two reveal conditions which are valuable in the design of a new machine. The shape of the armature or pole pieces, or the number of turns of wire on the armature greatly alter the shape of the wave produced.

The oscillograph is equipped with three vibrators that permit of placing three waves on the screen at the same time. This is very valuable for comparison studies. For example, we wish to make a study of the ringing current in the various bells on a heavily loaded telephone line equipped with twenty bridging instruments. We can place the current waves of the first and last bells as well as the voltage wave of the ringing machine on the screen at the same time. This allows one to study the characteristics of the curves under actual working conditions; and by a comparison, one is able to deter-

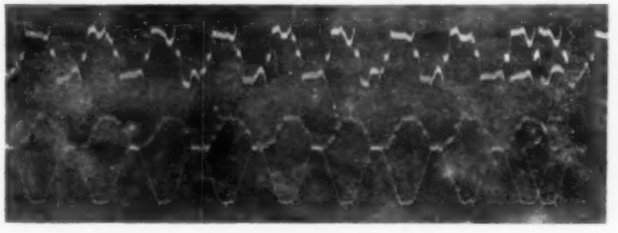


Fig. 8. Oscillograms.

mine the changes that are necessary to produce the best results.

The oscillograms of Fig. 8 show wave forms produced by three different commercial pole changers of different makes, operating under the same conditions. This clearly indicates the value of such an instrument for comparative tests. The waves, as will be noted, are widely different; yet each should be sinusoidal in shape. The central one, it will be observed, most closely approaches the true sine wave.

The oscillograph is especially valuable in making tests on the transmitter, revealing conditions whereby improvements can be made by slight changes or by entirely remodeling. It might be stated here that in the operation of the oscillograph, the waves may be observed visually on the ground glass or they may be photographed for permanent records.

Another corner of the company's laboratory is shown in Fig. 9. In this is shown the dynamometer used in making measurements of the current, voltage and watt output of various pieces of electrical equipment. This instrument is especially valuable in making accurate comparative tests of the current consumption of different pieces of apparatus.

The Kellogg Switchboard and Supply Company has gone to much expense in equipping and maintaining a testing laboratory, but it feels that it has been repaid

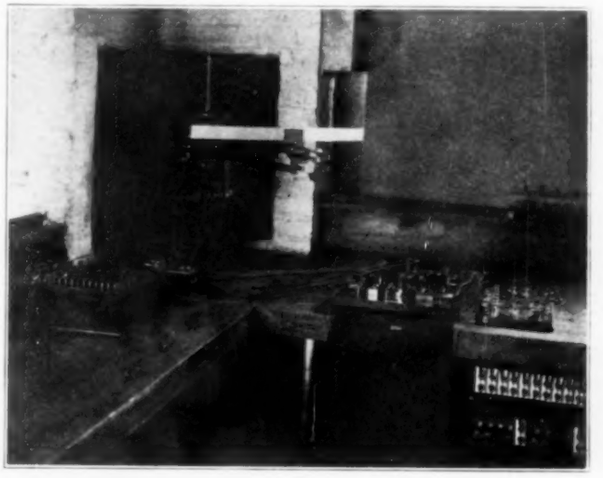


Fig. 9.

many times over, as the quality of its apparatus has been greatly improved in many respects. The improvements may not show in the outward appearance, but it has the assurance that the material used in the construction of its apparatus is what is required to produce the best results.

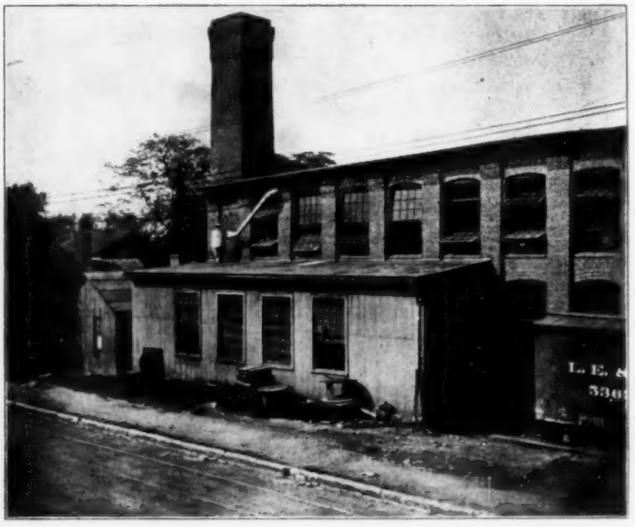
No manufacturer of electrical goods at this day and age of the world expects to keep in the race, if his goods are not constructed from the proper kind of material; and he can tell but little about the material without means of making a thorough test.

Calculation of Inductance and Resistance

A paper on "Inductance and Resistance in Telephonic Circuits" was read by Dr. J. W. Nicholson at a recent meeting of the Physical Society. A general formula for the effective inductance of a circuit consisting of two long parallel wires has been given by the author, and is suitable for cases in which the current distribution in either wire is greatly affected by the frequency of alternation. In the present paper certain important cases are examined in detail, and formulæ are obtained capable of immediate use. A calculation of the effective resistance is also made in each case. Attention has been mainly directed to that of the simple telephone circuit, in which the leads are not twisted round each other in order to annul the inductive effects of the earth and of neighboring circuits. Throughout the investigation only iron and copper wires as the two extreme cases are considered. The large permeability of iron completely changes the character of the effect of frequency on its self-induction. To all metals greatly used in practice except iron, the formulæ developed for copper wires may be applied.

The Big Shops of the Cumberland Telephone and Telegraph Company at Nashville, Tennessee.

By Joseph H. Atchison.



Manufacturing and Repair

THE idea of a telephone exchange running its own manufacturing plant will doubtless be a new one to many readers of TELEPHONE ENGINEER. It is not often that either the demand or the opportunity exists; even a well-equipped repair shop being beyond the scope of many operating companies. But in a very large system emergencies are bound to arise and sudden demands be made that require the quick production of finished material.

As an example of what one company at least has done in this direction, a few facts about the Cumberland Telephone and Telegraph Company's big shops at Nashville, Tennessee, will be of interest. Two years ago these shops were established, but there are few people now who know what is going on inside of the great buildings that cover practically two blocks of ground. In this monster plant the company is now manufacturing many of the articles it uses in telephone construction, such as telephone booths, the wooden boxes that accompany each instrument; coils, bells and numerous other articles too varied to mention. One of the most complete machine shops in the south is maintained there, and expert workmen are turning out finished products for all the 518 exchanges and the many miles of long-distance lines.

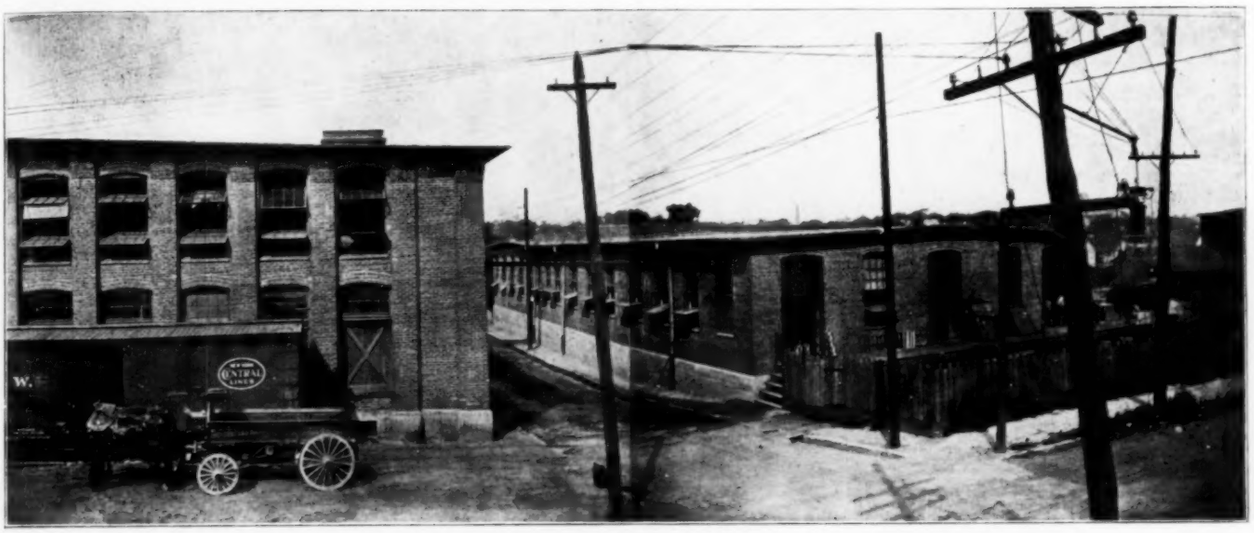
Wood Working Department, where Magneto Switchboard Cabinets, Booths and Packing Boxes are Manufactured and Repaired. Twenty-six are Employed.

The supply depots in Louisville, Memphis, New Orleans and other points are supplied from this great repository, and there is plenty of work there for the 135 men.

But the necessity for such an institution is a part of the story of the big establishment. When the Cumberland Telephone and Telegraph Company was organized, June 8, 1883, the company was formed by the consolidation of several very small plants operating exchanges in Evansville, Indiana, Henderson, Kentucky, Nashville, Memphis and a few other points.

None of these exchanges then had more than a few hundred telephones in use, the total in twelve exchanges being less than 4,000. The company's headquarters were soon moved to Nashville, and for several years it drifted along, making moderate progress, but by no means keeping up with telephone development in other sections of the country. In 1888, when O. F. Noel was president of the company, a contract was entered into with the American Bell telephone interests by which that company subscribed for a new issue of the Cumberland stock, which was increased from $1,187,500 to $1,695,700. Two years later the period of aggressive development came when James E. Caldwell was elected president and general manager and Leland Hume was elected assistant general manager. At that time the company had only twelve exchanges, no long-distance lines and only 3,800 telephones in use. Naturally, the company had little use for general shops, but George T. Hodge, the electrician, constituted himself the chief engineer and maintained a little room in a small building.

With the election of Mr. Caldwell as the head of the company came the era of expansion. Each year new towns were entered. In 1892 long-distance communication was pretty well established from Nashville to the Ohio river. It was about 1892 when the first line reached the Ohio river from Nashville, and was connected there with the long-distance lines east. One afternoon in Nashville, when celebrating the connection, H. W. Buttorff, head of the Phillips and Buttorff Manufacturing Company, was asked to talk to New York. Calling up a firm with which he did business, Mr. Buttorff exchanged greetings and placed an important order for goods with his New York friend—the first order for



Shops of the Cumberland Telephone and Telegraph Company, Nashville, Tennessee.

goods ever placed by a Nashville firm over the long-distance telephone.

In 1892 also the management gave George T. Hodge permission to establish shops for the company, which were established in one of the rooms upstairs in the present general office building. Three men besides Mr. Hodge were employed in the new shops.

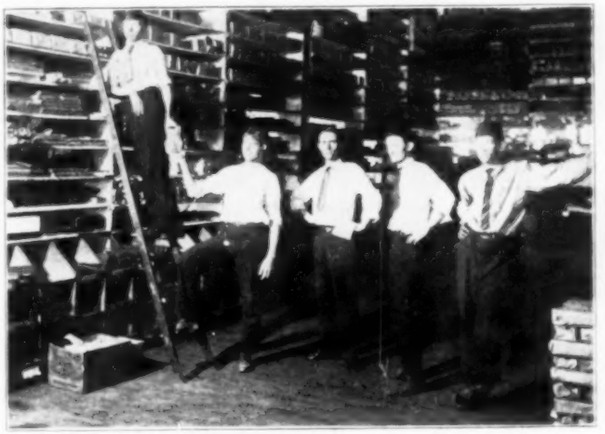
The aggressive era had come, and by this time was commanding attention. Town after town was entered, exchanges established, country lines built, until in 1898 the company had 53 exchanges and a number of toll lines in operation. That year the company added Mississippi and Louisiana to its territory and took over the system in New Orleans. The following year it entered Louisville by purchase, and at the beginning of the new century had 137 exchanges in operation, with 30,755 telephones in use.

But even as late as 1900 the company was by no means a big concern, measured by latter-day enterprises. In that year the company's capital stock was only $6,017,700, having been increased under President Caldwell's administration from $1,695,700. Its gross revenues then were $1,884,013.78. In 1900 the company began increasing in capital stock more than a million dollars each year, selling the stock at par and paying in the actual cash. All this money, as well as a good portion of the earnings, was expended for development, such as constructing new lines, entering new towns, erecting new buildings, building new exchanges, etc. The last issue of new stock was in 1907, when the capital was increased to $19,680,150. Its gross revenues had increased to $6,141,817.95 and the net revenues to $1,993,430.08.

Naturally enough, to operate so great a system the company found it necessary to develop some at home, so in 1906 the plans were made for the big shops in North Nashville. Two blocks of property were purchased and covered with substantial brick buildings two stories high. A good part of these buildings is required to handle the supplies of the company, which consist of thousands of items and go out each week to more than 500 local managers and construction crews all over the south. Having charge of lines entering a good portion of Indiana and Illinois, completely covering Kentucky, Tennessee, Mississippi and Louisiana, besides the many joint lines where it connects with other big systems, a vast amount of material is necessary. Wire in hundreds of classes, sizes and kinds is bought from the manufactories and brought to Nashville in bulk and in the shops there is prepared for use.

In this department of the shops many curious things are seen. Boys, girls and men are at work there unwinding all this mass of wires, measuring it, weighing it, insulating it, spooling it again and counting it out properly for the check of the storekeepers and disbursers. Here is where the principles of telephony are taught to the hundreds of employes that come in from off the system to get their course of training before taking their posts somewhere out on the thousands of miles of the system.

In the woodworking department of the big shops are a force of men manufacturing booths, wooden boxes, crossarms and many other needed things. Expert men in this department turn out some of the prettiest woodwork done in the country. In the switchboard rooms is another interesting sight. All the small and large switchboards used over the great system are manufactur-



Stock Room, where Small Apparatus is Issued to the Different Departments.

ed here, each marked according to the service it can render and sent out to the station needing such a board.

In the machine shops proper, where the heavy work is done, is one of the most complete metal-working establishments in the country. At an enormous expense this department has been perfectly equipped and is a place of interest from many points of view. Back of

Switchboard Stock Room, Showing a Number of Private Branch Exchange Switchboards.

this, and on the same floor, all the placing of instruments, burnishing of metals, etc., is done, and it is as pretty work as can be done in any establishment.

Being crowded out of the general office building uptown, the stationery department had to seek quarters in the shops, and in one corner of the big building will be found several carloads of stationery, blank forms, pads, reports, directories, etc. Each office throughout the country is supplied on requisition from this room through the branch depositories in Louisville, Knoxville, Memphis and New Orleans. Not a sheet of paper goes

Switchboard Department, where Magneto Switchboard Apparatus is Assembled and Wired. View Shows Two Sections of a Common Battery Switchboard Under Construction for Gulfport, Miss. Thirty-two are Employed.

out of this room unaccounted for, for the company wants to know what use is made of the paper for which it pays something like a quarter of a million dollars per year.

In the basement of the big shops, is perhaps, the most complete automobile garage in the south. The company has fourteen big automobiles there for the use of the officers, heads of departments, foremen and repair crews, and they are kept pretty well on the go. The place is built of reinforced concrete, and expert machinists are in charge. Several of these automobiles were built out-and-out in the company shops, with the exception of the engines, and they are as neat and serviceable as the best cars brought from the east.

But automobiles alone will not serve all the purposes of the company's employes, so a large stable is maintained adjoining the shops, where about fifty teams and as many vehicles of various kinds are kept.

To the layman perhaps the most interesting feature of the Cumberland company's big shops is the system in use there and the educational courses taught. One of the objects of the shops is to train men in the company's service and make telephone men of amateurs. This idea originated with Leland Hume, general manager of the company, some years ago, and he has at last perfected his plan and realized his hopes.

When a man enters the employ of the company down in Louisiana, up in Indiana, in Memphis or anywhere else, he is first used a while at the local exchange. If he shows a willingness to learn the business and applies for a better position, he is sent to Nashville, put

Coil Winding Department where Defective Relays, Ringer Coils and Generator Armatures are Repaired. Eight Employed.

in the shops and on the company's pay rolls, and drilled for months, or until he has learned the fundamental principles of the business. For the position of manager of a local exchange one can qualify in a few months by entering the shops' school, where it would require years outside. He is put through each department under an instructor, who sees to it that each detail is absorbed before moving on to the next department.

Instead of charging tuition, the Cumberland puts its students on the pay roll at a reasonable figure while they are in the shops. The pay is often very small, but always enough to pay board and other expenses, with a snug surplus for other purposes.

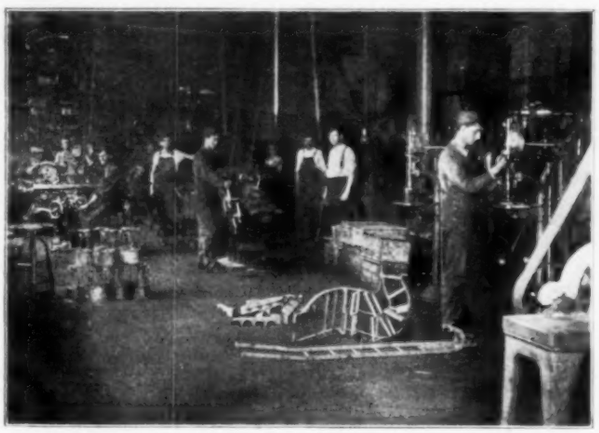
A thing in the general shops that will attract the visitor is the perfect system in saving every particle of material. All the old telephones that get out of order throughout the country, or are burned in buildings, all the old material of every kind and character is sent to the Nashville shops, regardless of its apparent value. Here it is cleaned up; each screw, nail, bit of wire, and even the battered and broken bits, are taken out, cleaned and put in boxes for inspection. All that can be used

again is counted out, classed or measured and placed where the supply man can get it for use again. Absolutely nothing is lost but the noise, and there is not much of that.

Experts in telephony have a corner of their own in the shops, where they are constantly working out theories, discovering new uses of materials and men and perfecting systems in the business.

A system of departments under one central management is the story of the operating department of a great telephone system, and none of them perhaps have surpassed the record for development established by the Cumberland. In the past few years the management has been giving its attention to the development of farm lines, and in the past three years hundreds, even thousands, of lines have been run out the country roads to farm houses. In this department the Cumberland company has its experts, both in soliciting and construction, and the requirements are met, it appears, everywhere. In this line, perhaps, lies the greatest opportunity for development before the managers of telephone companies. The cities have grown so used to the telephone that necessity does the work, and all the company has to do is to give the proper service and keep its plant up to the requirements. Entirely new fields are constantly springing up, however, and the farm or rural business is one of the most important.

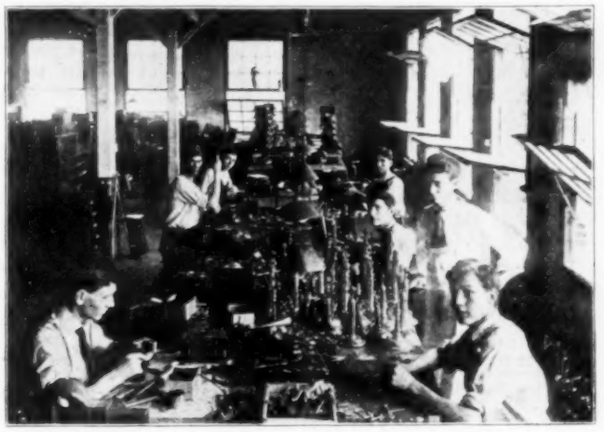
Of little less importance than the farm department is the railroad end of the business. Until a few years ago the railroads gave little thought to using telephones along their lines, but it is quite common now for railroads to use the telephone for transmitting many classes of messages, and some of the roads are using the telephone extensively to dispatch trains. Only two weeks ago the Illinois Central Railroad Company contracted with the Cumberland company for a copper line from Louisville through Memphis to New Orleans, and that line has practically been completed. Although owned by the telephone company, it is operated by the railroad,



Machine Shop, where Iron Distributing Frames, Relay Racks and Cable Troughs are Constructed and Blow Torches, Cable Box Protectors, Coin Collectors, etc., Repaired. Twenty-one Employed.

and is connected with the Cumberland's wires only through certain exchanges. In a few years, telephone students think, the railroads will be using the telephone almost exclusively, holding their telegraph wires mostly in reserve in case of accident.

With the exception of wire and certain metals and patented parts, the Cumberland Company buys practically all of its material in Nashville. All the wood used, except the poles and creosoted crossarms, is bought in that market and many things are purchased there by preference when they could be bought cheaper in large quantities in other manufacturing cities. This is especially true of building hardware, nails and numerous other such things. While the company has other depositories, Nashville is also the chief banking point for the company.



Subscribers' Set Repair Department where Common Battery and Magnet Sets and Pole Changers are Repaired. Thirty Employed.

Columbus Company Makes Improvements

The Columbus Citizens Telephone Company has begun the construction of five sub-exchange buildings to contain automatic sub-exchange switches for trunking subscribers' calls to, through, and from the main exchange. All of these will be unattended exchanges, of the same general type as the Indianola exchange.

Immediate installation will be respectively 225, 275, 300, 200 and 100 lines. Besides these new exchanges, the company is adding 100, 25 and 25 lines respectively, in three subexchanges previously in service, making a total of 1,250 additional switches.

There will also be some cable extensions into new districts which may ultimately become additional subexchange districts.

In anticipation of a possible change of this sort, the switchboards upon which these extensions will operate will be distinctive, so that if the additional exchanges are established the switchboards can be moved to the new locations or additional switches there established without any change in the numbering system.

In the establishment of the subexchanges, the cable now used for subscribers will be utilized for trunks, and in addition, the cutting-over of subscribers to the subexchanges will relieve cable for additional subscribers between the subexchange districts and the main exchange.

The subexchange buildings are all to be placed upon the small corners cut off of the rear of building lots in such manner as to leave the lot substantially as valuable as before. In one case, the narrowness of the lot necessitated the cutting down of the projecting eaves. The general type is one building inside of another.

One difficulty with unattended working machinery is to keep it free from moisture. In the construction of these buildings particular care is taken to make them substantially air-tight. In order that no water may be

used in their construction so that equipment troubles will follow the drying out and in order that they may be fire-proof, the sides are of asbestos boards which will be painted with a water-resisting paint. Asbestos shingles will cover the roof.

In the construction are various applications of asphaltum and of cork board, as well as a special quilt between the linings of the outside buildings for additional protection against dampness and changes of temperature. The ventilating openings and the doors will be arranged for air-tight closing.

As additional precaution against dampness and sudden changes of temperature, provision will be made for electrical heat and for a gas stove, which will be entirely closed against air of the room and will get its draft from and discharge its gases into the outside air. There will be provision made whereby small quantities of lime may be exposed in the inner room to absorb any atmospheric moisture. A cent's worth of lime will absorb the surplus moisture in a saturated atmosphere of 1,000 cubic feet.

The battery room will be entirely separated from the switchboard room, and will have its own ventilating pipes.

Drainage is provided to take away from the building not only the water from the roof but also any that may tend to seep in from the ground surrounding the building.

The Egner-Holmstrom Telephone Apparatus

This new invention, which has recently been tested with great success, inasmuch as easy and entirely satisfactory telephonic conversations took place between Sundsvall, North Sweden, and Paris, via Copenhagen, with Copenhagen in the line for hearing, has attracted much attention in all interested quarters. The two inventors, both engineers on the staff of the Swedish State Telegraphs, have for several years been engaged in experiments for the purpose of improving the telephone, and have also brought about valuable improvements in the microphone, but the recent long-distance telephone experiments have not referred to these inventions but to the use of heavy power currents instead of the comparatively feeble currents of ordinary telephone work. This makes it possible to increase the dispatched energy current at will, and with an energy forty times that hitherto reached; it has been possible to telephone double the distance that was possible with the ordinary equipment. Experimenting has been going on between Berlin-Copenhagen-Stockholm and between Berlin-Cologne-Hamburg-Stockholm, and now most recently between Paris and Sundsvall. It was also the intention to experiment by way of London-Paris-Copenhagen, but owing to the less satisfactory state of the Channel cables, this plan has in the meantime been abandoned. With special arrangements it had hitherto been possible to telephone a distance of 1,800 to 2,000 kilometers by using expensive 4.5 to 5 millimeter copper wire, but this distance was considerably reduced when wire of smaller dimensions, or submarine cables, were inserted in the line. The two inventors saw that a new departure would have to be made, and their first efforts were to construct a microphone capable of standing a comparatively heavy current, which naturally would increase the distance over which telephonic conversation could be carried on. Their experiments, which commenced in February, 1907, had, as early as the beginning of 1908, been carried so far that the principles had become clear. A new apparatus was constructed, based upon these principles, and in March, 1908, the first experiments were made on the Berlin-Stockholm line; the result was excellent, but the inventors preferred to keep silent about it pending the perfecting of the method. Both the Swedish and the German authorities have done all in their power to facilitate the experiments, and conversations with the new apparatus have taken place between Geheimepostrat Braun, in Berlin, and General-Director Rydin in Stockholm. The experiments carried on in Sweden have given the following results as to the respective capacity of the ordinary Swedish State telephone apparatus and that of the Egner-Holmstrom type:

	Longest Distance in Kilometers with Ordinary Apparatus.	Longest Distance in Kilometers with the New Apparatus.
With 3-millimeter copper-wire line	1,000-1,200	2,000
With 4.5-millimeter copper-wire line	1,800-2,000	4,000
With 3-millimeter iron-wire line	180-200	400

In all these experiments the microphone current used for the new apparatus was from 1 to 1.25 amperes. If the strength of the current is increased, there should be no difficulty in talking over almost any distance, but at present there is hardly any reason to go in for a microphone current stronger than the one mentioned above. The invention is also expected to prove of considerable importance in the matter of wireless telephony. —*Engineering.*

New Telephone Lines in India

Present conditions in India show evidence of the ameer's desire to do everything possible to improve the internal communications of his country by the vigorous manner in which a line of telephone wire is being pushed forward from the Indian frontier at Jellalabad to Herat, in close proximity to the Persian border. This line is now almost completed, and several branch lines are under consideration. Along this line telephone stations are being set up with trained operators in charge at distances of about three miles in order to prevent delays through breakdowns, and to secure the swift transmission of messages. Should it be found necessary, special military guards will be posted along the route of the wire in order to prevent damage by the nomadic tribes through whose country the line runs for the greater part of its length. So far, however, these tribes have shown no tendency whatever to interfere with the line or its workings, and, indeed, do not appear to pay the slightest attention to it. Apart from the commercial value of a line of telephone which will ultimately bring practically the whole of Afghanistan into communication with the Indian empire, via Jellalabad and Peshawur, its advantages from a military point of view can scarcely be over-estimated and in the contingency of a hostile advance toward India through the ameer's dominions it would be possible by means of the wire to convey ample warning to Peshawur of what was going forward. It is not surprising, therefore, to hear that the Indian government is willingly lending to the ameer all the assistance he desires in the construction and maintenance of the line.

How to Read Telephone Circuit Diagrams

By David S. Hulfish

Copyright, 1909, by Electricity Magazine Corporation.

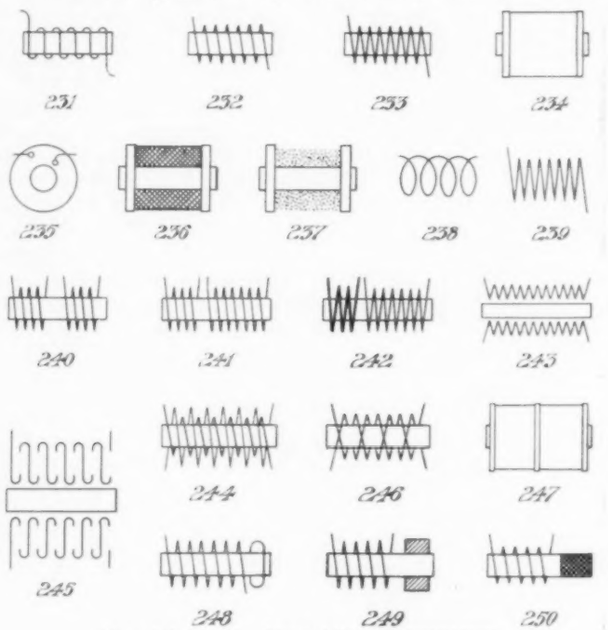
LESSON IX.

THE electromagnet consists primarily of a coil of wire and a soft-iron core. See Figs. 231 and 232, which show the two elements properly related. Fig. 233 shows a further simplification of the same symbol.

Variations are found in the shape of the core, in the number of the windings, in the relations of the windings when there are more than one upon the same core, and in the polarization of the core by the field of a permanent magnet. The core shape most commonly met is the straight cylinder, or round rod, of soft iron.

A single-wound straight-core electromagnet is shown in the symbols of Figs. 231 to 239, inclusive. Figs. 231, 232 and 233 show side view of the core and a few turns of conductor about the core; Fig. 234 shows side view of a full spool of wire from which the ends of the core may or may not be seen projecting; Fig. 235 shows end view of a spool, with terminal wires leaving it; Fig. 236 shows a sectional view through a full spool of wire; Fig. 237 shows a similar symbol, but with another adaptation of symbol for showing the cut ends of the turns of wire surrounding the core; Figs. 238 and 239 show the coil of wire only, and properly are not symbols for an electromagnet, certainly not good ones, but sometimes are so used.

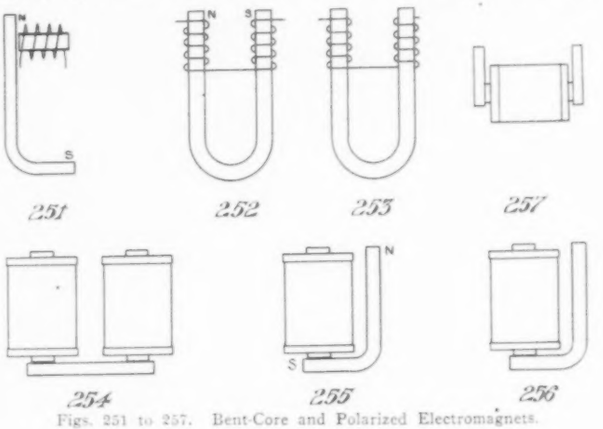
Electromagnets having two windings are represented



Figs. 231 to 250. Straight-Core Electromagnets.

by the symbols of Figs. 240 to 250. As these symbols are merely amplified by duplication of windings when a larger number than two is desired, symbols having more than two windings need not be shown.

The symbol of Fig. 240 represents a double-wound electromagnet having two windings of equal turns; presumably the windings are duplicates in all respects. Fig. 241 shows unequal windings; unequal numbers of turns are shown, and probably there is unequal resistance also; the symbol of Fig. 242 emphasizes the unequal resistance by showing one of the windings in heavy line value, typifying a heavier wire used in the winding, and therefore of lower resistance. In Fig. 243 the windings are upon the core, but are shown adjacent to it. In Fig. 244 the two windings are both the full length of the core. In Fig. 245 the two windings are shown separated from the core, and in Fig. 246 they are again shown upon the core. Fig. 247 shows merely a view of a spool, the partition in the middle of the spool indicating that there are two windings, one on each side of the partition.



Figs. 251 to 257. Bent-Core and Polarized Electromagnets.

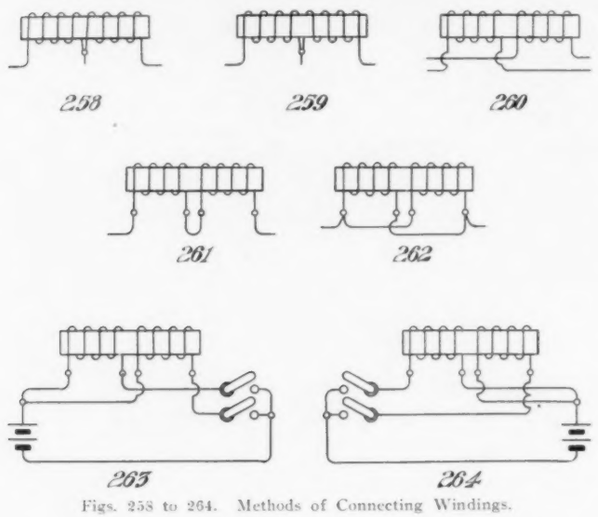
Fig. 243 does not reveal the direction of the winding upon the core, so that the polarity of the core could not be determined from the symbol even if the direction of current flow in its helix circuit were known. The same is true of the symbols of Figs. 233, 234, 242 and 247.

Compare the symbols of Figs. 232 and 233. In Fig. 232 the direction of winding is shown, and the polarity of the core may be determined by the rule if the direction of current flow is known. In Fig. 233 this is not true. Compare Figs. 240 and 247 and the same is true. Compare also Figs. 243 and 245. In Fig. 245 the core may be imagined placed through each of the coils in turn, and the broken lines thus come to have an interpretation revealing the direction of the winding about the core. In Figs. 244 and 246 also the direction of the winding about the core is determined in the symbol. A discrimination between the symbols of Figs. 244 and 246 may be noted in the relative directions of the windings. In Fig. 244, proceeding from left to right along both of the windings, the conductor passes in the same angular direction around the core; in Fig. 246, proceeding from left to right, the conductor passes in different directions around the core. In Fig. 245 also the conductors pass in different directions around the core when traced through from left to right.

In Figs. 248, 249 and 250 a peculiar form of double-wound magnet is presented by the symbol. This is

called the slow magnet, slow-acting magnet or sluggish magnet. In Fig. 247 a single turn of a conductor is shown about the core as one of the windings; in Fig. 249 this single turn is shown as a thick disk, or heavy ring. In construction, it usually is a heavy block of solid copper bored to fit the core and forced upon one end of the core. The symbol sometimes takes the form shown in Fig. 250.

Fig. 251 shows an electromagnet in the field of a



Figs. 258 to 264. Methods of Connecting Windings.

permanent bar magnet. In Fig. 252 the electromagnet is combined with the permanent magnet, the coils of the electromagnet being placed upon the poles of the permanent magnet.

There are two fundamental forms of electromagnet, the single pole and the double pole. The names are taken to designate the number of magnetic poles presented to the armature which the magnet is to move. The return-pole magnet is a specific type of double-pole magnet. Double pole magnets are shown in Figs. 252 to 257 inclusive. In Figs. 252 and 253 the horseshoe shape of core is shown, Fig. 252 being different from Fig 253 principally in the showing of permanent magnetic polarization of its core, but differing also in the relative direction of its windings on the two poles. Fig. 254 shows a U-shape magnet which is the most common of all forms of double-pole magnets. A heel piece of soft iron connects the rear ends of the two spools. Figs. 255 and 256 show return-pole-piece magnets, and differ from each other only in the showing of permanent magnetism. In Fig. 257 extension pole pieces for both ends of a single spool are shown, whereby the single straight core may present both of its ends to an armature lying parallel to the core.

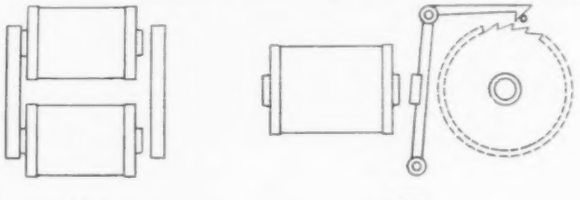
Certain relations sometimes existing between the windings of multiple-wound magnets may be studied before leaving the subject of magnets in general. The symbol of Fig. 258 shows a split-wound magnet; Fig. 259 a differentially wound magnet. In each of these symbols the windings are so connected in the symbol as to indicate that the device is wound to provide that special connection. Fig. 260 symbolizes a magnet with two independent windings which may be connected in any manner desired. The magnet of Fig. 258, when its helix is traced from extreme terminal to extreme terminal in either direction, at all times has its current effective to magnetize its core, yet either part of the core may be used independently; this is called a split winding. Fig. 259, when traced similarly from either extreme terminal to the other extreme terminal, in either direction, has its current ineffective or differential upon its core, and the core can be magnetized only when current is flowing through the middle terminal. Both Fig. 258 and 259 are three-terminal electromagnets.

Fig. 261 shows series connection of the coils of a double-wound magnet and Fig. 262 shows multiple connection of a similar electromagnet.

With reference to the direction of current flow through a double-wound electromagnet, Figs. 263 and 264 show the two possible combinations. In Fig. 263 the coils are cumulatively connected, either of the coils magnetizing the core alone, and both together magnetizing it cumulatively, or more strongly as the result of adding the energy of both currents. Fig. 264 on the other hand shows the coils differentially connected; either of the coils may energize the core, but when both of the coils are carrying current at the same time, then the energy of one current is opposed to the energy of the other, and the core is magnetized by the difference only. If the coils are equal in turns and currents, or in any other combination are equal in ampere-turns about the core, then when current flows through both of the coils the core will not be magnetized at all.

The difference between the split and differential electromagnets of Figs. 258 and 259 may be understood by comparing with Figs. 263 and 264. When the full resistance of Fig. 258 is taken in a single circuit, it cannot be connected differentially; when the full resistance of Fig. 259 is taken in a single circuit it is differential. The relative direction of the windings on a multiple-wound electromagnet always is a matter of importance in reading a circuit diagram.

The feature of utility in the electromagnet is found in its ability to draw a piece of soft iron toward its core when a current is passing through its winding, and to release the piece of soft iron when the current through its winding ceases. The piece of soft iron thus controlled is called the armature of the magnet. In a telephone receiver, the armature itself is properly shaped and acts as the sound producing diaphragm of the receiver; in a ringer, with a tapper rod and a ball attached it acts to sound the signal bell. At times the armature may carry a pawl for driving a ratchet wheel, and at other times it may operate an electrical switch. Fig. 265 shows symbol for a double pole electromagnet with armature, and



Figs. 265 and 266. Electromagnets with Armature and Pawl.

Fig. 266 shows symbolically an electromagnet with armature for driving a ratchet wheel.

A relay is an electromagnetically operated electric switch. Its function fundamentally considered is that of a connecting link associating two circuits in such relationship that the opening and closing of the second circuit may be controlled by opening and closing of the first circuit. For this purpose, the winding of a relay is included in the first circuit and the switch or contact points

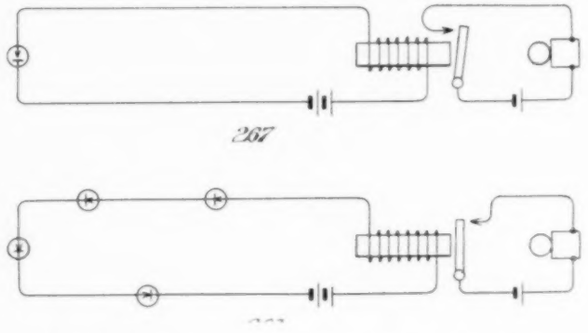
of the relay are included in the second circuit. This is illustrated in Fig. 267. The push button at the left is intended to ring the vibrating battery bell at the right. The button when operated closes a circuit through the larger battery and the winding of the relay, thereby energizing the core of the relay, which then attracts its armature. The armature, pivoted at the bottom, moves its upper end against the adjacent contact point, thereby closing a circuit through the smaller battery, the bell, the armature and the contact point, thus ringing the bell. As long as the push button is open, the bell circuit will be open; as long as the push button is closed, the bell circuit will be closed and the bell will ring. The relay of Fig. 267 is a direct-acting relay, since it reproduces in its armature circuit or "local" circuit as it is called, exactly the conditions of opening or closing that are performed in its helix circuit, or so-called "line" circuit.

Fig. 268 is a diagram including a reverse-acting relay. This holds its local circuit open so long as its line circuit is closed, and vice versa. In this diagram, the opening of any of the four closed push button symbols would open the circuit of the helix; when the circuit of the helix is opened, the armature is released, the local circuit is closed and the bell is rung until the main circuit again is closed.

These two relays show the simplest forms. For a few possible variations in types of relays and arrangements of their contacts, imagine the combination of any one of the electromagnets of Figs. 231 to 264 with any one of the switches of Figs. 197 to 229.

Any arrangement of contact springs desired may be combined with any arrangement of windings. A few typical illustrations will serve to give such an understanding of the principles of relay symbols as to make intelligible any of the innumerable variations which will be met in reading miscellaneous diagrams.

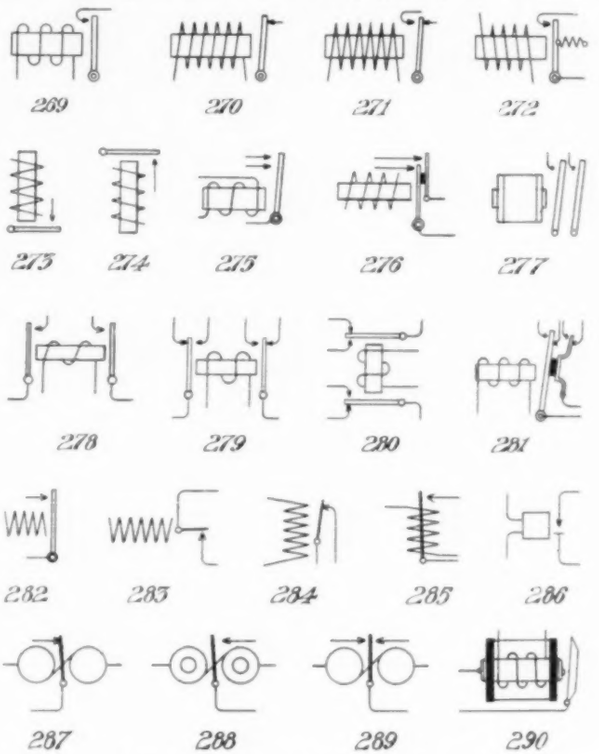
The simplest type of relay must necessarily be the simplest type of electrical switch operated by the simplest type of electromagnet. This is typified in Fig. 269; a two-point switch in this case is formed by a fixed contact point and a movable magnet lever and a single-wound



Figs. 267 and 268. Simple Circuit Combinations with Relays.

electromagnet is positioned near the magnetic lever, which lever forms the armature of the electromagnet.

Fig. 269 gives a simple symbol for a two-point direct-acting relay; it is the magnet of Fig. 231 combined with the switch of Fig. 211. Fig 270 symbolizes a reverse-acting relay of the simplest form. Fig. 271 shows a similar symbol for a make-and-break relay; it is the magnet of Fig. 233 combined with the switch of Fig 224 or of Fig. 213. Fig. 272 shows an elaboration of the symbol of Fig. 269, a tension spring being added to the armature, to return the armature to its original position, after it has been moved by the magnetism of the core and has been released upon the cessation of the current energizing the core. The retractile spring, or some retractile means, usually is assumed in a relay symbol; it is shown but seldom. Sometimes the armature is shown inclined as in Fig. 270, indicating that the restoring force probably is gravity. In Fig. 273 it would be true, apparently, that gravity would restore the relay to a condition of open contact, but unfortunately for that theory, that symbol is just as likely to be found in the position shown in Fig. 274, where certainly gravity was not con-



Figs. 269 to 290. Simple Relay Symbols.

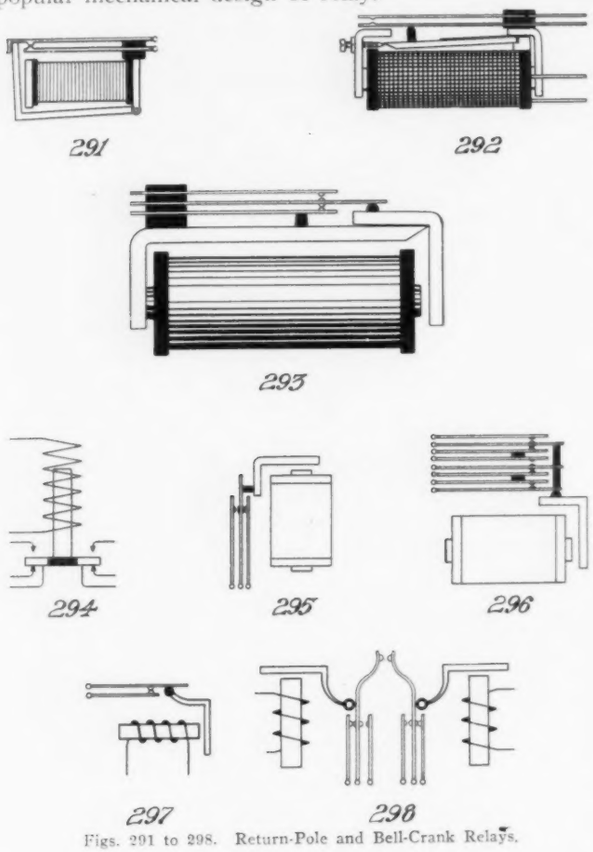
sidered when drawing the symbol. The rule is that the retractile means is omitted, and it must be assumed that the armature retracting means exists in any symbol where such a means is required.

Plural contacts are shown in the symbols of Figs. 275 to 281. Fig. 275 shows the magnet of Fig. 231 combined with the switch elements of Fig. 225. The complex arrangements of plural contacts are simplified by showing two armatures in the symbols of Figs. 277 to 280; it is likely that the physical relays have but one armature, the double armatures being but a convenience in drawing the symbol. Figs. 277 and 278 show the switch of Fig. 201; in one symbol the two armatures are at one end of the core and in the other they are differently arranged. Figs. 279 and 280 show the switch of Fig. 198. Figs. 276 and 281 show auxiliary contact springs carried by the armature in lieu of a second armature.

Figs. 282 to 285 show symbols in which the magnet symbol of Fig. 239 is used. The armature lever and contact point are combined with the helix in almost any magnet, being actually a combination of helix and switch into a symbol for a relay without reference to the core. Fig. 286 presents a magnet in its side view without showing either the spool heads or the core ends, the relay con-

tact being shown without detail of the armature. The symbols of Figs. 282 to 286 do not suggest to the reader the operation of the relay so well as do other symbols of the group; they are found in foreign diagrams more frequently than in America.

Figs. 287 to 289 show end view of the magnets of the relay, combined in each case with a symbolized armature and contact. Fig. 288 shows a symbol in which the core froms a part of the local circuit, and carries the fixed contact point. The symbol follows closely a once popular mechanical design of relay.



Figs. 291 to 298. Return-Pole and Bell-Crank Relays.

Fig. 291 is a symbol, but shows the type of mechanical construction of the relay. The magnet is of the style of Fig. 257, and the armature is of appropriate shape to operate the switch springs. In Fig. 292 the magnet is of the style of Fig. 257, but the pole pieces are bent toward each other, the armature being hung between the pole pieces and the core. This arrangement of core, poles and armature shows the seeming anomaly of an armature moving away from its core when attracted. The tendency of armature movement is to close the air gap of the magnetic circuit, and this is done by an upward movement of the left-hand end of the armature of Fig. 292, thus lifting the lower of the switch springs and closing the armature switch contacts. Fig. 293 symbolizes a common type of return-pole-piece relay with bell-crank armature. Fig. 294 shows a relay without a core, since the armature occupies substantially the place of the core. When a current passes through the solenoid, the rod is drawn into the coil, and the switches attached to the end of the rod are operated.

Any of the symbols previously given may be used for any of the types of relays here shown with mechanical detail. In addition, the mechanical construction of the bell crank armature gives another set of symbols which also are used for symbols to represent any type of mechanical construction. Bell crank symbols are shown in Figs. 295 to 298 inclusive.

Fig. 295 symbolizes the relay of Fig. 293. In such a symbol, as in such a mechanical relay, the switching springs lie parallel to the core and may be of any number and of any arrangement of contacts. In Fig. 296, the magnet symbol of Fig. 234 is combined with the switch of Fig. 227. Fig. 297 shows another form of bell-crank armature symbol. Fig. 298 shows two such symbols so related that the energization of either relay alone will operate its own set of three springs, and the energization of both of the relays at the same time not only will operate the two sets of three springs each, but will cause the two long springs of the two sets to be moved into contact with each other.

It is evident that the electromagnet of a relay may be wound in any way desired, and with as many windings as desired, and with any relation. The substitution of any magnet symbol, or any type of winding, from Fig. 231 to Fig. 264, inclusive, may be found in the symbol of any relay.

(To be continued.)

Pole Damage by Woodpeckers

Considerable damage is being done to telephone, telegraph and electric light poles by members of the woodpecker family. These birds originally built their homes in the dead or dying trunks or limbs of trees, but for some reason best known to themselves, have come to the conclusion that the peeled pole offers better conditions for a home.

They have become so ravenous of late that their depredations are attracting considerable attention among those who are compelled to use quantities of wooden poles. Their activities spread over a wide portion of the United States, notably in the south, southwest and central west. Cedar poles seem to be the ones most frequently attacked. The birds bore into them at any height from the ground, and the holes which they make are often two or three inches in diameter and four or five inches deep. Such an amount of wood drilled from a stick of timber which is carrying a load of wires naturally weakens the strength of the line.

Frequent inquiries have been made by the Forest Service in this connection, but the only information to date which the government has been able to obtain is that on a casual inspection of treated and untreated pole lines in Louisiana, in that region it was found that poles which had been impregnated with creosote oil were not attacked by the birds, whereas untreated poles under the same conditions were very severely injured.

Whether or not creosote will prevent such attacks is not definitely known, but the Service is investigating this problem, and should this oil prove a preventive, it will fulfill a two-fold purpose. It will protect the poles from decay and destruction from animal life. In southern Indiana, some members of a traction company thought that they could prevent further destruction of their poles by filling the holes in the wood with stones. The birds, however, simply drilled around the stones and made the conditions much worse. This apparently does not seem to be a means of preventing their depredations.

What Is the Matter?

By J. C. Kelsey

LAST month I visited several financial institutions which make a practice or pretension of handling bonds. One individual particularly, a strong man too, certainly gave me a line on how Chicago bankers' interests look upon telephone securities.

I mentioned a company, in excellent physical condition, earning $130,000 a year, setting aside $16,000 a year for depreciation, and still having a net income for securities of $42,000 annually. This company requires $300,000 to clean up some indebtedness and do some necessary and profitable extension work. The interest required would be $15,000, leaving $27,000 available for stock. But he decidedly informed me that he could not handle it because the investor would not buy. A good reason too. Further, he mentioned that the trouble was that poles and wires did not appeal to a man about to foreclose. I assured him that if he ever paid any telephone construction bills, he would learn that poles and wires have only a small part in the assets, and that there were relatively few foreclosures.

Security buyers are ultra-conservative. They are so ultra that they get it in the neck as often as the rash buyer of mining stock.

It is a funny game, this investment proposition. In talking to the gentlemen interested, you will get the idea that the people who buy these securities have some rights. But they have not. Bonds are absolutely as much at the mercy of scrupulous or unscrupulous management as stocks.

A group of railway men will buy up some old streak of rust real cheap. They put out numerous securities, and then take some over-worked railroad man and put him on the job to pay temporary interest upon train-loads of securities. They will issue mortgages of all kinds and descriptions, first, second and third: then some equipment bonds; then convertible bonds, preferred stock and, of course, common stock. But these securities will all be sold easily, and our ultra-conservative investor pats himself on the back for his wisdom.

When this bunch of railroad men think it is time, the train-loads of securities will strike a derail switch, and then what becomes of the confused and tangled maze of finances? You know, and I know, that the security holders will get it exactly in the neck, with a precision that would arouse the jealousy of Dr. Guillotine.

But this is neither here nor there. Why does this idea exist that wires and poles are all there is to a telephone plant and not enough to base security upon? It cannot be on the grounds of youth. Irrigation bonds go like hot cakes, and the art is young. If there is anything permanent in a ditch full of water, I am sure I am surprised. It's a hard job filling a valley with settlers and making them pay up regularly. Your ditches fill with mud, and contrary seasons make debt. Debts make slow land payments. But irrigation bonds give the idea of farm land, and our ultra-conservative investor is contented—because land is the keystone in the security arch, as well as the foundation.

Gas bonds sell readily, yet the careful investor can find rusty and electrolysis-eaten pipes, if he cares to look a few feet underneath the ground. Besides, gas is a declining factor in lighting, and is on the toboggan, like brewery securities.

Telephone bonds can not be rejected on the grounds of lack of salable assets. Outside of bills and notes receivable, there would be very little left even for the bondholders of a manufacturing company, if it ceased to make profits and lay idle for a time. In ninety days the windows would be broken and the machinery would be rusty. Nobody but the second-hand man could have any success with it.

In a telephone company, copper wire plays a large part, and is always salable. Staple materials throughout are used. Rubber, iron, platinum, copper, German silver, lead, mahogany and oak. Surely these items indicate stability.

Long term franchises and other liberal grants signify telephone communication. People will always talk and the art of communication has not reached its maximum effort.

You can't say that railways and gas plants are permanent factors. Steam plants see possible electrification. Gas plants are fearing electric light—some day without heat, and at little expense to generate. But talk will go on forever.

There are six fine railroads carrying passengers to Minneapolis from Chicago. Two cents a mile, too—really less, as it is $8 for 420 miles. An awful cry of distress went up from the railroads, and still the gross and net earnings are better than ever.

But there will never be more than two telephone companies competing for the voice communication business. Besides, telephone lines can carry on rapid telegraph work too. The range of phantom and ghost circuits is a wide one.

Telephone companies are really transportation companies, but of course they lack ties, steel rails, ballast and rolling stock. Investors must have these toys.

Telephone bonds cannot be rejected because of competition. I know that our ultra-conservative investor dreads competition. To his single mind, competition is the death of trade. But there is no use in going into a discussion of this freak of mentality. Railroads are certainly in competition in spite of laws and gentlemen's agreements.

Telephone bonds may be in bad odor because of the newspaper warfare between Bell and independent interests. I know that the average person believes 98 per cent of what he reads, and 2 per cent of what he hears. If you and I are in the same business and we condemn each other in exaggerated fashion, are we going to get listeners or readers to believe us? If I tell the world you are a liar and you say I am one, we have no trouble in proving it to the people.

The claim of natural monopoly is as groundless as the all-healing powers claimed by the great proprietary medicine that is so popular in the dry districts.

The old grammar—Reid & Kellogg—had two sentences in it that always appealed to me: "He who runs may read," and "People who live in glass houses should not throw stones." As a boy I wondered what it meant—"He who runs may read." But I never wondered at the glass house principle and I do not yet. I only won-

der why more people and more interests do not recognize it. It is only a version of the golden rule, and it is eminently practical.

For the Boston news bureau to carry on the warfare of the past into the future, is very, very foolish. Rushing into print with explanations is like laying a lost ball game to the umpire. The world only looks at the score. The old score of the Bell Telephone Company is something that is hard to forget.

The bragged-about present Bell depreciation reserve of $21,917,142 should be kept dark. The Bell claims 3,000,000 telephone stations and even reckoning at the Keystone depreciation rate of $4 per station per year, this monster total would only cover two years' depreciation. It looks as if the Bell depreciation rate ranged much under $1 per station per year. Take a lesson from the Keystone plan, please, and keep still, Mr. Press Bureau.

There is another reason—before the Bell interests condemn independent securities, they should be sure that their own are in good shape.

They are trading American Telephone & Telegraph Company stock even, for New York and New Jersey Telephone Company stock. A good bargain. With A. T. & T. at 140 and N. Y. & N. J. at 130, it is a good trade for the holders of the minority stock.

Minority stock holders are all right, if their stock is listed on an active exchange. But a minority stockholder, with unlisted stock on his hands, has just two customers for his stock—one the majority, and the other, another easy mark like himself!

The A. T. & T. Co. has offered to trade for Pennsylvania Bell, also Buffalo and Pittsburg interests. In each case, comparative bargains are offered.

But what kind of a trade will this company offer to stockholders of the unlisted properties? Will it be as fair in the dark as in the light?

Look at the trade of Western Electric stock in November of last year. The employes were practically forced to make the trade. It is said that those who did not trade have since been dropped from the lists of the holy.

The whole life of a company is bound up in its employes. If you abuse them, you abuse yourself. If you reward them, you reward yourself. All this sounds like a fraternity ritual or a mission Sunday school talk, but it would be well for Milk, LaSalle and Wall streets to give heed. A body of discontented employees sometimes accounts for vast business with no profits.

The astute gentlemen who engineered the trade of Western Electric stock for $250 worth of convertible bonds certainly were playing safe when they put in a clause that they would reserve the right to pay $225 in cash. Will any one answer why an investor, paying $260 for this stock, should willingly put his neck in a noose held by a hostile majority interest, by giving an option on his holdings at $225? Not unless he was an employee or a timid fool.

Ever since that trade, Chicago papers have published the price of the stock at $200 and $190 and yet not a share can be bought. Occasionally a Bell man washes a few stocks, and the price hangs beautifully at $200, but you yourself can't buy any at $200. Cunning!

In the plant of the Western Electric Company, capitalized at $15,000,000 there are over $50,000,000 worth of assets. The plant could shut down, and windows could break, but you would still find such tremendous lists of property and material it would surprise you.

On top of this the company has $10,000,000 of good will. No one can brag of good will unless they have customers who can't (not won't) buy elsewhere. This makes $60,000,000 worth of property, or $400 per share. Yet the minor stockholder is suffering the pangs of a freeze-out.

Charging off great chunks of depreciation in order to keep the profits down; building new buildings and buying real estate and charging it to expense to keep the profits down; both games began with the construction and operation of Noah's ark. And courts have no difficulty in seeing through it. Surely, this is a part of the reason why telephone securities are "in bad."

Another reason is that employes, frozen and frostbitten, tell their friends how they got it; and no wonder the bank official hears it and says, "Keep off"!

I have never yet talked with a financial man who said the bond trade of November 15 was anything else but a raid. Will there be another raid? Do you know any enthusiastic Bell stockholders? Do you see any reason why telephone affairs should have any reputation at all?

I fear that Jonathan Edwards and Cotton Mather have turned over in their graves.

Will the A. T. & T. Co. play as fair with its unlisted minor stockholders, as it does with the minor stockholders of the properties listed in the broad daylight of the New York stock exchange?

The Bell people can set a good example to the world by showing a disposition to be merciful and fair to the helpless minor stockholders of their unlisted properties. If they are fair, they can get every share outstanding. And further, people will soon have some faith in the integrity of the larger telephone interests.

Moral—Throw away the burglar's kit.

California Franchise Decision

That the state administration may give a telephone company the right to run its lines through a city without a franchise from the city itself is the effect of a decision handed down by the United States Circuit Court of Appeals at San Francisco, Cal.

The case was that of the Sunset Telephone & Telegraph Company against the city of Pomona, an appeal from the judgment of the Circuit Court at Los Angeles. The city of Pomona had cut down some of the poles of the telephone company when the company refused to apply for a franchise. Action was brought for an order to stop the officials from destroying the lines, but this was refused in the Circuit Court.

The Court of Appeals, however, decided that the company had a right under the civil code of California to run the wires through the city without a franchise. The judgment of the lower court was therefore reversed. Judges Morrow and Ross concurred in this opinion, but Judge Gilbert dissented.

It is not thought that this decision will necessarily mean that the Sunset company will win its suit against the city of Pasadena, which was submitted to the State Supreme Court recently. In that case the question is not whether the company may trade without a franchise, but what amount the city has a right to charge for the franchise. In Pasadena, as well as Pomona, the city officials pulled down the company's telephone lines.

Items of Legal Interest

By Ralph M. Loring

RIGHT TO USE STREETS.

Rev. Laws 1902, Chapter 25, Section 54, and Chapter 26, Sections 2, 6, authorize the board of aldermen of a city "to permit telephone and telegraph lines to be laid under any way or square" and to establish reasonable regulations regarding the same. Chapter 122, Sec. 2, as amended by St. 1906, p. 79, chapter 117, provides for a petition to the board of aldermen for leave to erect poles in the highways and construct lines for transmission of electricity, with notice to landowners along the way of a time and place of hearing, and authorizes the board, after a hearing, to specify in writing "where the poles may be located, the kind of poles, the height at which and places where the wires may run." Held, that an order of the board of aldermen, without any petition notice to landowners, or hearing, as contemplated by law, granting a telephone company the right to locate above and below all present and future streets of the city all such structures as may be adopted to the installation and maintenance of an electrical or other system for "the transmission of sound, signals, and intelligence," is void. *Metropolitan Home Telephone Company* v. *Emerson. Supreme Judicial Court of Massachusetts.* 88 *Northeastern* 670.

LICENSE FEE LIMITED.

A borough imposed on a telegraph and telephone company anuual license fees at $1 per pole, $2.50 per mile of wire, and $30 per mile of conduit. The court in proceedings under Act April 17, 1905 (P. L. 183), found the rates were reasonable. The superior court on appeal found that the fees charged were about three times the sum paid by the borough for inspection duties during the year, and that the inspection of the conduit after it was let was merely perfunctory, and very little time was needed in inspecting the pole line, and that after a new construction of a line there was very little to apprehend from the natural decay of material for several years. *Held*, that the superior court properly reduced the amount of the license fee, the proper rule to guide in such case being the cost of necessary inspection. *Delaware & Atlantic Telegraph & Telephone Company's Petition. Supreme Court of Pennsylvania.* 73 *Atlantic* 175.

POWER OF MUNICIPALITY TO FIX MAXIMUM RATES.

Chapter 4052, p. 89, Laws 1891 (section 1024, Gen. St. 1906), confers upon municipalities the power to forfeit the franchises, etc., of any street railroad, gas, electric light, telephone, or other company or corporation, under which such company or corporation is using the streets, etc., upon the violation of the terms and conditions of the grant of such privileges, etc., or upon failure to comply with any reasonable provision of any ordinance of such municipal corporation regulating the use of the streets by such company or corporation, etc.; but these provisions do not confer upon a municipality the implied power to fix maximum telephone rates to be charged by a telephone company using the streets under an ordinance which contains no reservation of the right to fix such rates. *City of Jacksonville* v. *Southern Bell Telephone & Telegraph Company. Supreme Court of Florida.* 49 *Southern* EJT.

BREAKING OF POLES.

Where one erects alongside a public road telephone poles on which telephone wires are placed, and a person climbs one of such poles by permission of the owner to remove the wire for the purpose of removing a building for another across such road, and the pole, because of its "rotten condition," breaks and injures such person, the owner of such poles is not liable in damages to the injured party because the poles were erected along the roadside "without authority or right, and contrary to law," and such pole was knowingly allowed to stand in a "rotten condition." The acts of alleged negligence were not acts of negligence relatively to the party injured while climbing the pole for the purposes stated. *Morris* v. *Rounsaville Bros. Supreme Court of Georgia.* 64 *Southeastern* 472.

TRANSMISSION OF MONEY.

Plaintiff's sister died at her house, and, not having money to buy a coffin or to transport the body to the child's home, she telephoned her father, and he contracted with defendant telephone company to transmit the money by telephone, which was done; but the money was delayed in delivery, and it was too late to get a coffin on the day it was delivered, so as to ship the corpse on that day, it being shipped the next day. *Held*, that the contract to deliver the money was made by plaintiff's father for his own benefit, plaintiff being merely his agent for preparing the body for burial, so that she could not recover damages for mental anguish suffered because the child remained in the house for a longer time on account of the delay. *Curd* v. *Cumberland Telephone & Telegraph Company. Court of Appeals of Kentucky.* 119 *Southwestern* 746.

LIMITING CHARGE IN FRANCHISE.

Where a telephone company, organized under transportation corporations law, was granted a franchise by a city, authorizing it to construct its lines over the public streets and highways, and also in, over, and under squares, parks, aqueducts, and other public places in the city, and to repair, replace, enlarge and extend the same as might be necessary, such franchise conferred on the corporation greater rights than it secured by virtue of its incorporation, which excess rights constituted a sufficient consideration for the company's covenant not to charge any subscriber for service within the city more than $48 per year per instrument. *Rochester Telephone Company* v. *Ross. Court of Appeals of New York* 88 *Northwestern* 793.

FALL OF POLE.

One maintained without permission from the fiscal court reasonably safe telephone poles in the outer edge of a highway. A severe windstorm blew down a tree, and it fell on a pole, breaking it off and causing it to

fall into the highway. He did not know of the fall, and could not by the exercise of reasonable diligence discover it before an injury to a traveler on the highway in running over the pole. *Held,* that he was not liable for the injuries to the traveler, as the fact that the poles were maintained without authority was not the proximate cause, and as the windstorm and the falling of the tree was the proximate cause. *Burton* v. *Cumberland Telephone & Telegraph Company. Court of Appeals of Kentucky.* 118 *Southwestern* 287.

TELEPHONE PARTNERSHIP.

A partnership organized solely to provide its members with telephone connections with a company operating under a municipal franchise could only show damages sued for because of failure to make connection by showing loss resulting to each member, and the petition charging that all agreements made with defendant were for the benefit of each and all the members, and that defendant knew this at the time the various transactions were had, it was not error, because they were nominally partners, to permit each member to show and recover for his individual damages. *Cumberland Telephone & Telegraph Company* v. *Cartswright Creek Telephone Company. Court of Appeals of Kentucky.* - 119 *Southwestern* 793.

LINEMAN GUILTY OF CONTRIBUTORY NEGLIGENCE.

An experienced lineman, employed by an electric light and power company as a "trouble hunter," looking for a "live ground," must exercise a very high, if not the highest, degree of care for his own protection; for he must be deemed to be aware of the dangerous nature of the work he is called on to perform, and must know that, if he permits himself to come in contact with a grounded wire while handling a heavily charged wire, serious injury, if not death, is certain. *Miline* v. *Providence Telephone Company. Supreme Court of Rhode Island.* 72 *Atlantic* 716.

INJURY FROM GUY WIRES.

Where, in an action for injuries to a pedestrian stumbling over a guy wire anchored in the edge of the sidewalk, there was evidence that the guy wires were frequently incased in boxes to make them more conspicuous, and that there was no box, an instruction authorizing a recovery on the jury finding negligence in constructing and maintaining the wire, and in thus obscuring it from vision, was not erroneous, for the jury might find that the omission of the wooden box was incomplete construction. *City of Fort Worth* v. *Williams.* Court of Civil Appeals of Texas. 119 Southwestern 137.

DUTY OF TELEPHONE COMPANY.

A long-distance call for plaintiff was put in, to call him to his sick child, and the telephone company was informed that plaintiff was working at a certain railroad roundhouse in the city to which the call was directed. *Held,* that such statement was a mere direction as to the place where plaintiff would likely be found, and did not relieve the telephone company from making a further diligent search for him, on being informed that he was not at the place designated. *Southwestern Telegraph & Telephone Company.* v. *McCoy.* Supreme Court of Texas. 119 Southwestern 88.

PLACING OF TELEPHONE POLES.

Where defendant telephone company was legally entitled to erect a pole in premises adjoining plaintiff's residence, such pole not being a nuisance per se, though erected close by one of plaintiff's windows, defendant was not liable for injuries to plaintiff caused by a burglar entering plaintiff's house by means of the pole through a window, though, when the pole was erected, plaintiff objected to it, and requested that it be placed further from her house because it afforded easy access thereto. *Jenkins* v. *Louisville Home Telephone Company. Court of Appeals of Kentucky.* 120 *Southwestern* 276.

CITY LIGHT WIRES ON TELEPHONE POLES.

Where a city strings electric light wires on poles of a telephone company, under an ordinance giving it the right to so use the poles, an employe of the telephone company, whose duty it is to work upon the poles about the wires of such company, owes the city no duty, but the city is charged with the highest degree of care to furnish a safe wire in the first instance and to make sufficient inspections to keep the wire in a reasonably safe condition, and the employe has the right to rely to some extent on the city's discharge of its duty. *Hodgins* v. *Bay City. Supreme Court of Michigan.* 121 *Northwestern* 274.

DUTY TO FURNISH SUFFICIENT HELP TO UNLOAD POLES.

A master requiring servants to unload telephone poles from a wagon is bound to use due care to furnish a reasonably adequate number of men to handle the poles with safety to the servants.

Whether a master assigned a sufficient number of servants to the task of removing a heavy telephone pole from a wagon to perform the work safely *held,* under the evidence, to be for the jury. *Fitter* v. *Iowa Telephone Company.* Supreme Court of Iowa. 121 Northwestern 48.

INJURY BY LIGHTNING.

One suing a telephone company for injuries by lightning entering a house while he was using the telephone must show by experienced persons that the company was negligent, as alleged, either in attaching the wire to a tree, or in failing to have a ground wire; the matter not being within the knowledge or experience of the jury. *Rural Home Telephone Company* v. *Arnold.* Court of Appeals of Kentucky. 119 Southwestern 811.

CONTRIBUTORY NEGLIGENCE.

A lumber stacker going upon a runway for the first time to engage in work requiring his whole attention is not guilty as a matter of law of contributory negligence in not observing a rotten plank partially covered with bark and particles of lumber so that the defect is obscured. *Ozan Lumber Company* v. *Bryan.* Supreme Court of Arkansas. 119 Southwestern 72.

INFRINGEMENT OF CURRENT CONTROLLING DEVICE.

The Dean patent No. 722,212 for a current controlling device for telephone circuits, the purpose of which is to prevent the greater part of the steady current from passing through the subscriber's receiver, is not infringed by the device of the Manson patent No. 818,897, which operates on a different principle. *Kellogg Switchboard & Supply Company* v. *Dean Electric Company.* U. S. Circuit Court, Northern District of Ohio. 168 Federal 549.

Who's Who in the Telephone Game

Facts and Fancies About a Man You Know or Ought to Know

IN attempting to tell something of this telephone man, the sane, the insane, the Cezanne—there it is, all right, defying all resolutions to keep it in order. Cezanne! Ever hear that name before? Now, if it was Issachar Thomas, or something like that, it would be easy; but James Cezanne! Well, it has come down through a long string of antecedents until it is Cezanne V with its present owner, who can't help it, and wouldn't if he could. It gambols back to 1560 or thereabouts, when the French Huguenots had a leader by that name who was slightly more austere and upright than others of his austere and singular associates.

He was Intended for the Ministry but the Deck was Stacked.

But what's in a name, anyway? Nobody knows James Cezanne Kelsey. Everybody knows Kelsey, and lots of people know him as Professor, or Jim, or Jack. Probably he is more widely known than any other independent telephone man in America, by which is meant he knows more men than others in the business, because he never forgets. Forgetting is bad for the man who has a large acquaintance.

Kelsey broke into the game the moment he graduated from the Kansas State University at Lawrence in 1895. He went to Hiawatha and assumed the duties of city engineer, operating the electric light plant and waterworks. A year later he was with the Emerson Electric Manufacturing Company at St. Louis, and in 1897 he was installing electric light plants for the Ft. Wayne Electric Works. When he had finished such a job at Staunton, Illinois, he became that city's electrical engineer—the choice following a competitive examination. But Staunton couldn't hold him, and he went back to the Ft. Wayne company to superintend the building of a system of lighting for Lancaster, Pa. An accident, which was nearly his undoing, retired him from the work, and he returned to Kansas. While recuperating he was acting electrician for Kansas City, Mo. In the spring of 1898, having fully recovered from his Lancaster injuries, and failing dismally to win the heart of a fair hospital attendant who nursed him back to life, he plunged with despair into the telephone department of the Western Electric Company, installing the first common battery exchanges at Minneapolis, St. Paul, Duluth and West Superior. In the fall of the same year he became the engineer for the Northwestern Telephone Exchange Company, operating all plants in Minnesota and the Dakotas. In 1901 the Duluth Telephone Company, operating at Duluth, West Superior and the Iron Range country, selected Kelsey as engineer and general superintendent. Shortly following the appointment, Purdue University, Lafayette, Ind., invited James Cezanne Kelsey to accept the chair of telephone engineering—the pioneer university of the country to acknowledge telephone engineering as a distinct phase of electrical diversion. And they showed wisdom in extending their invitation to the right party. With all the enthusiasm of his old Jayhawker baseball days he grabbed the university chair and began to score.

You probably wouldn't guess that Kelsey is a professional ex-baseball player. Let's see. In 1893-4-5 he was owner-manager-captain-catcher of Kelsey's Colts, Winfield, Kan., U. S. A. Winfield was part of the state league, and Captain Kelsey and his brave chiefs drew two of the three pennants in those three strenuous years. He was known then as Grandstand Jimmy. He had John Kling of White Sox fame as an adversary, and "skinned him alive." Fred Clark of the Pittsburg Pirates was one of the Kelsey warriors, and roasts Jim yet for not staying in the game. That Kelsey was something above the average as a base ball performer and star is borne out by this little incident: As professor of telephony at Purdue, Mr. Kelsey—observe it—Mr. Kelsey was retained by Kansas City as an expert in the matter of telephone rates when the contest with the Missouri & Kansas Telephone Company was being fought out in the courts. As the city's expert, the Professor had given some testimony that was out of the ordinary and the Bell counsel was anxious to strike out the damaging evidence. Judge Tarsney, for the Bell, in the cross examination sneeringly referred to the "expert" and said, "Look at him, your Honor, why this is our old friend 'Grandstand Jimmy,' the ex-professional baseball player of Winfield; you remember him, don't you? How did he become a telephone expert?" And Grandstand Jimmy looked the counsel straight in the eye—a habit he has to a beautiful finish—and said "Judge, no man who slides home ever asks the umpire whether he's out!" It was in this famous case that the city with its expert established fourteen out of fifteen contentions and won the case before the

referee appointed by the supreme court to hear it.

Two years later, while still at Purdue, the Professor acted as expert witness in patent causes for the Kellogg Switchboard & Supply Company and served in similar capacities in many cases in Indiana and Illinois.

But before that he was a member of the jury of awards for the International Electrical Congress at the St. Louis World's Fair and was a large factor as disburser of medals and ribbons. He was also one of the few American telephonists who received an invitation to contribute a paper to the Congress.

Kelsey isn't a Bourbon—he doesn't believe in Thrasymachus' definition of justice—"the interests of the stronger." The old feudal government, based upon the assumption that the many exist for the benefit of the few would have made Kelsey a refugee or something worse. He accepts the utilitarian theory and believes that life is divinely organized for mutual service. Of course, there are exceptions—prerogatives, precedents, and other things especially designed for salesmen, that he is keen to observe. Funny scheme Kelsey has of working satisfactorily for everybody and retaining his freedom to do stunts on the side. That's why his life is so chuck full of achievement. Every year totals the incredible. For example, he is now sales manager for the Kellogg Switchboard & Supply Company, and a splendid good one at that. He has held the job since 1905, but he has also been connected with Fisk & Robinson, New York, a firm of financial brokers who have, upon Kelsey's recommendation, helped worthy independent enterprises. For this company Mr. Kelsey rendered the original report on the refunding of the Keystone Telephone Company's property. He has made periodical inspections of this plant ever since his first look-in in 1905, when he introduced the praiseworthy estimate of $4 per station for annual depreciation—a classic in telephone affairs that is meant to endure until the whole present scheme of operating is abandoned.

In a similar capacity he made a complete inventory of the Stromberg-Carlson Telephone Company's plant; has been all over the American Union Telephone Company's system and for a time was threatened with the presidency of the latter. He has appraised systems in all parts of North America. The North Dakota Independent Telephone Company owes much to him in finally agreeing upon his splendid suggestions.

When there is a squabble over rates on anywhere, about the first man on the job is Kelsey. He has performed for the Oklahoma legislature, the boards of public works at Indianapolis and other cities and his opinions are always pivotal.

Men are generally unconscious of their growth, but Kelsey is especially so. The sudden exigency which arose early in his life made the boy of yesterday the man of to-day.

Mr. Kelsey was born at Leavenworth, Kansas, May 18, 1872. He lived among the hardy pioneers of the Jayhawker state when grasshoppers, Indians, hot winds and drought made pessimists of everybody. He was intended for the ministry and became a theological student, but the deck was stacked, which goes to prove that the outside of a man isn't always a safe guide for estimating the inside of him.

Kelsey is married and has a son six years old and an infant daughter. He claims Kansas as his home—back to mother—but he lives in Chicago.

Telephones in Brazil

Consul-General George E. Anderson, of Rio de Janeiro, reports as follows on telephones in Brazil, and the demand for supplies which the extension of the system will create:

An American company which is constructing a system for the State of Rio de Janeiro secured its concession about three months ago, and already has the construction of the system well under way. One of the chief objects of the enterprise is to afford communication by telephone between the city of Rio de Janeiro and the country surrounding it, including Petropolis, the summer capital of the country; Nictheroy, the capital of the State of Campos, and other important points.

There is great need in Brazil of telephone service in many parts of the country not reached by the government telegraph system, or in which the telegraph system does not meet the requirements of business. Although Brazil has 20 states and a territory substantially the same as that of the contiguous territory of the United States, it has no interstate telephone line and, by reason of the interstate restriction, it has few telephone lines serving rural districts within the several states themselves. The telephone business in Brazil is little developed in either extent or service.

According to official returns, there exist in Brazil a total of 39 telephone systems, ranging from 22 to 2,503 subscribers, of which, at the time the statistics were prepared, last year, 15 were Berliner, 9 Kellogg, 3 Bell, 4 American, and the others German, Swedish, Norwegian, and French. The total number of subscribers in all the systems is 9,200. The capital of the companies ranges from $900 to $1,190,000. Of these companies only 5 have more than 500 subscribers, viz., Bahia, Rio de Janeiro, Pernambuco, Pelotas, and Sao Paulo.

The concern in Rio de Janeiro, the largest in Brazil, is now owned by the American syndicate which has purchased all the public utilities of the city. It is capitalized at $1,190,000. Since the present owners took charge it has been re-established upon a modern basis with American instruments and underground wires. While its service is not up to the American standard, owing to the lack of proper personnel in the operating rooms, it promises to be a satisfactory modern service. The system has 2,676 connections and about 21,000 miles of wire.

The system in Bahia also has recently been purchased by a new concern, which is introducing a modern American system. At the time the statistics were secured it had 554 instruments and about 1,400 miles of wire. The Bell system is in use.

In Pernambuco the system is Norwegian and German. It has 631 instruments, about 1,000 miles of wire, and about as many subscribers as instruments.

The system at Pelotas, in Rio Grande do Sul, has instruments of diverse makes to the number of 1,479. It has about 2,400 miles of wire and a capital of $180,000.

In Sao Paulo the system is one of the most important in Brazil. It is equipped with 1,997 Kellogg instruments, has about 3,300 miles of wire, and a capital of $450,000.

The British government will lay a telephone cable equipped with Pupin coils across the English Channel to be connected with the land lines at Dover and Calais in order to improve the communication between London and Paris.

The Testing of Galvanized Iron

By M. E. Chester

THE process of hot galvanizing, which consists in applying to iron or steel a coating of zinc by dipping the iron or steel to be covered in a bath of molten zinc, was introduced about 1846. The rust resisting value of this protection depends largely upon the thickness and uniformity of the coating of zinc; hence it was early recognized that a suitable test for the zinc coating was an important matter. Over fifty years ago European periodicals made reference to a test for galvanizing by dipping the zinc coated iron article in a solution of water saturated with copper sulphate, and this test, refined in detail to produce uniform results, is in general use today.

The purpose of this article is to describe in detail a refinement of the so-called copper sulphate test which the writer believes will be found quite satisfactory for material galvanized by the hot dip process, especially galvanized wire and strand used largely for telephone and telegraph purposes.

This test is a chemical means of judging of the thickness, continuity and uniformity of the zinc coating of galvanized iron articles, and rests upon the two following observed facts:

1. Both zinc and iron have the power of displacing copper from solutions of certain of its salts, for example, copper sulphate; that is, a certain amount of these metals will be taken into the solution and a corresponding molecular amount of copper will be deposited.

2. The physical form of the copper displaced by zinc and iron is different. With zinc the deposit is a loose, spongy mass, varying in color from almost black to a light brownish-red, while with iron it is a bright, dense, adherent, metallic film.

In brief the test is carried out as follows:

A definite amount of neutral, standard copper sulphate solution is placed in a suitable vessel and the galvanized article to be tested is dipped into this solution for a period of one minute. The article is then taken out and the spongy copper thrown down by the zinc is removed from the test piece by washing in water, rubbing with a cloth and then drying. The sample is then examined to see whether any iron has been exposed, which will be indicated by the formation of a bright copper film which cannot be removed by the washing with cloth and water. The operation of dipping for one minute and then washing is repeated for a specified number of times, or until the iron is exposed. During the test the temperature of the solution and test piece is maintained as nearly constant as possible, as the temperature effects the rate at which the chemical reaction takes place.

While, as outlined above, this test is apparently a very simple one, there are many points to be observed in order to obtain consistent, comparable results. The copper sulphate solution must be carefully prepared and its temperature during the test maintained almost constant. The test pieces should be thoroughly cleaned and the details of manipulation always carried out in exactly the same manner.

In addition to the difficulties arising from improper manipulation of the test or poorly prepared testing solution, there are other troubles due to the difficulty of determining just when the first iron is exposed. As the zinc coating is dissolved by successive dips, the deposited copper gradually becomes less spongy and more like the coating produced by iron. Finally, all kinds of iron do not give a copper deposit of equal brightness and adherence. In general, it may be stated that the deposited copper is the brightest and most adherent on iron and mild steel, and less bright and adherent on high carbon steel. To aid in determining when the iron is exposed, it is best to compare the test pieces with standard pieces of the same material as those under test, which have had the zinc removed by hydrochloric acid and have then been coated with copper by immersion in copper sulphate solution. This point will be mentioned later.

In order to obtain the best results the writer has found it advisable to observe the following points as to the testing solution, the samples and the general manipulation of the test.

SOLUTION.

The testing solution is a neutral copper sulphate solution, having a specific gravity of 1.186 at 65 per cent Fahrenheit. Formerly it was the practice to specify only a saturated solution of copper sulphate without reference to temperature or density. Since the point of saturation varies considerably with the temperature, it was found necessary to specify a definite specific gravity at a definite temperature, in order always to obtain a solution of the same strength.

The most satisfactory method of making up the solution has been found to be by dissolving commercial copper sulphate crystals in cold water, in the proportion by weight of about one part of crystals to three parts of water. Cold water is used in preference to hot water, since with hot water we obtain a solution which will be supersaturated when cooled to a temperature of 65 degrees Fahrenheit, and an excessive amount of free sulphuric acid is formed which must be neutralized. The free acid in the solution is neutralized by adding an excess of pure copper oxide and allowing the solution to stand until a sufficient amount of this copper oxide has been taken up to neutralize fully any free acid formed during the solution of the crystals of copper sulphate, or which may have been carried in the free state by the crystals. The proportions above indicated will yield a solution slightly more concentrated than required for use. After the solution has become thoroughly neutralized and the excess of copper oxide has settled, the clear solution is poured off through a filter into a clean containing vessel. When it is desired to use the filtered, neutralized solution, a portion of it can be brought to a temperature of 65 degrees Fahrenheit and sufficient pure water of the same temperature added to bring the specific gravity down to 1.186. When a number of tests are frequently made, it is desirable to have a considerable quantity of the solution in the three different stages of the process, that is, saturating, neutralizing and filtering. The vessels for the different processes are placed at different levels, so that the solution can run

from one vessel to the next until it is received into the vessel for the standard solution. A perforated porcelain basket is desirable for holding the crystals in the saturating vessel.

An ordinary hydrometer is used in determining the gravity of the solution, the readings on the hydrometer being taken from the bottom of the meniscus.

SAMPLES.

Test samples of galvanized wire and strand are usually about one foot in length, selected at random to represent a shipment. It is important that all the samples be free from grease, oil or dirt before being immersed in the testing solution, in order to insure the uniform action of the solution over the entire surface of the test piece. The samples may be cleaned by rubbing them with cotton waste saturated with benzine, turpentine or a non-inflammable mixture of equal parts of benzine and carbon tetrachloride. The samples should then be thoroughly dried, washed in clean water and wiped and dried with cotton waste. In the case of miscellaneous galvanized hardware which is to be tested by this method, all of the sample which is to be immersed in the solution should be cleaned; that is, with small pieces, such as nuts and bolts, the entire piece will have to be cleaned, while with large samples, such as cross arm braces and the like, only that portion of the sample need be cleaned which is to be tested.

THE TEST.

In order to produce a uniform test, it is necessary that a definite quantity of solution be used in connection with a fixed number of samples; for example, wire samples should be tested in a glass jar which is about two inches in inside diameter and enough of the solution taken to fill the jar to a depth of at least four inches. Miscellaneous hardware samples are usually tested in a glass or earthenware jar containing at least one-half pint of standard solution for each sample to be tested. It is better not to use the same solution for more than one series of four dips. These precautions insure a more uniformly proportionate strength of solution and a consequently uniform action upon the zinc coating under test. In the above amount of solution, not more than seven wires nor more than one sample of other galvanized material should be simultaneously immersed. Where several samples of wire are immersed at the same time, the samples should not be grouped or twisted together but should be well separated so as to permit the action of the solution to be uniform upon all immersed portions of the samples.

As previously noted, it is necessary to hold the temperature of the solution and the test pieces during the progress of the test at as nearly a constant temperature as possible. It has been found, however, in practice that an operating temperature ranging from 62 to 68 degrees Fahrenheit is about as narrow a variation in temperature as can be maintained. This range in temperature is necessary because the chemical reaction between the zinc and iron and the solution gives rise to a certain amount of heat, and a consequent raising of the temperature of the solution. The difficulties of maintaining an absolutely constant temperature are not alone due to this chemical reaction which takes place between the test pieces and the solution, but are also due to the fact that the temperature of the room where the test is taking place may be considerably above or below the temperature which it is desired to maintain in the testing solution. It will consequently be found necessary at times to surround the vessel in which the test is taking place with water, either cooled or warm as the circumstances may demand. The test pieces, after each successive dip, should be washed in water of about the same temperature at which it is desired to hold the testing solution, in order that they may not unduly affect its temperature. The increase in the temperature of the solution, due to the chemical action, varies with the relative amount of solution and the zinc surface immersed, as well as with the temperature of the water surrounding the testing vessel and the air of the room. The following will illustrate the way this reaction will affect the temperature of the solution:

If seven No. 12 B.W.G. galvanized wires be immersed in the required amount of solution, the temperature of the solution will be raised about 5 degrees at the top and 2 degrees at the bottom. Consequently, in this case it is necessary to start each dip with a solution temperature between 62 and 63 degrees Fahrenheit, in order to prevent the temperature at the top rising above 68 degrees Fahrenheit at the end of the one minute dip. Before the samples are again dipped the solution should be once more brought back to a temperature of 62 to 63 degrees Fahrenheit by thoroughly stirring it and cooling in ice water.

Having prepared the solution and the samples as above described, and having brought the former to the proper temperature, the necessary amount is placed in a suitable vessel and the cleaned, dried samples for test are immersed for one minute. At the end of the minute they are quickly withdrawn and immediately washed in clean water of the proper temperature and wiped dry with clean cotton waste. A stiff brush should not be used in cleaning the samples as there is a possibility of injuring the zinc coating. The sample is then thoroughly examined to see whether any iron has been exposed. The dipping is then repeated the required number of times, the number of dips usually applied being four, though in some cases, as with very small wire for instance, this number may be reduced. If, after four dips have been given to the article as described above, there should be a bright, metallic copper deposit upon any part of it, except as noted below, the lot or shipment which it represents is considered defective, while if no such deposit is observed, the lot is considered satisfactory. It sometimes happens that, due to impurities in the zinc coating, there will be spots on the zinc on which the copper is deposited in a fairly adherent film somewhat resembling that deposited by iron, and this firm deposit of copper will appear at this point after each dip. This phenomenon is not considered cause for rejection, nor are deposits which appear within one inch of and end which has been cut.

In the case of the failure of one wire in a group of sample wires dipped together, or where there is a reasonable doubt as to the nature of the copper deposit, two check tests are made on additional samples from the same coils or lots from which the doubtful samples were taken. If the tests on these additional samples show that the majority of the samples meet the requirements of the specification, the shipments which they represent are considered satisfactory. In order to identify, in doubtful cases, the color of the bright metallic copper deposit, which indicates exposed iron

or steel, it is necessary to compare the samples in question with the deposit obtained on a surface of iron or steel of the same kind as that under test, which is known to be free from zinc. This iron or steel surface may be obtained by taking some of the samples from the lot under test and stripping the zinc off with hydrochloric acid until it is known positively that all the zinc is removed. These stripped samples are dipped in the testing solution and the copper deposit thus obtained can be used as a standard in judging whether or not the samples under test have failed. The standard should be made on the same day the tests are made, as the bright metallic color of the copper film changes on exposure to the air, due to the oxidation of the copper.

The copper sulphate test as described above was originally designed for testing iron galvanized by the hot dip process, and if the necessary precautions as noted above are taken the results obtained are very satisfactory. During the last two or three years there have come upon the market articles galvanized by two other methods; one the so-called electro or cold galvanizing process and the other the sherardizing or dry galvanizing process. If the copper sulphate method is used on galvanizing produced by either of the above processes, it is found that it works much less satisfactorily than in the case of the hot galvanizing, and the results of such tests are not comparable with the results obtained on hot galvanizing.

The principal difficulties in applying this test to articles galvanized by the two new methods seem to lie in the fact that the zinc coatings are of a decidedly different character from that produced by hot galvanizing. With the hot galvanizing the coating is coarsely crystalline and the copper deposit from the solution on such a coating is spongy and easily removed, while the zinc coating obtained by either the electro galvanizing process or the dry galvanizing process is either very finely crystalline or amorphous, and the copper deposit on such coating is rather bright and adherent, and resembles very closely that produced by iron. From the fact, therefore, that the zinc coating produced by these two processes yields a copper deposit which is very firmly adherent, the difficulty of judging correctly whether or not iron has been exposed is very greatly increased. In addition to this, even where it is possible to tell exactly whether the deposit is produced by zinc or iron, the reaction proceeds much more slowly than in the case of hot galvanizing, since the more firmly adherent and dense coating caused by the zinc tends to slow down the solvent action of the solution. The copper sulphate method, therefore, is not very well adapted to the testing of either electro galvanized or dry galvanized articles, nor can the results obtained by this test on articles so galvanized be compared with those obtained on hot galvanized material, in judging the relative protective value of the zinc coatings produced by the three processes.

An American consular officer stationed in the Barbary States furnishes the name of an official to whom correspondence should be addressed in regard to the projected telephone system which it is hoped will be installed at the place in question. The officer advises that prices be quoted f. o. b. New York City, and that the French language be employed when writing, as English is not understood by the addressee. The file number at the Bureau of Manufactures is 3387.

Wooden Poles and Ties

The enormous and steadily increasing demand for wooden poles and ties has exhausted the northeastern forests of cedar and chestnut, and also the scant supply of southern cedar or juniper. The chestnut that is left east of the Mississippi river is jealously guarded for local consumption by the large railroads along which it stands, who have locked it up by excessive freight rates. The future supply of ties and poles must come largely from the southern forest, and much of it now comes from there. Southern yellow hard pine, because of its hardness, pitch and rosin, is the choice of steam railroads, and of many standard electric railways, for ties and octagonal poles, especially of the heart quality, which brings the highest price, as being the most durable under all conditions. Railroads are learning the folly of specifying sawed ties, as thereby they raise the market price to that of sawed lumber, whereas if hewn on four sides by negroes the cost is about 10 cents less per tie. Sawed octagonal poles are very popular as a substitute for iron poles in city work and cost about one-fifth as much. Their life is greatly increased by protecting them at the ground level by a slight concrete casing at small cost.

The cypress round pole is said to be the future round pole. To make up for lack of strength it is specified about one inch larger at the top than chestnut or cedar, the butts averaging smaller and the taper being more gradual. Cypress is very porous and when used in a cold climate great care should be taken to house and seal the tops thoroughly.

A Pledge of Courtesy

The agitation for greater courtesy between users of the telephone, as exemplified in TELEPHONE ENGINEER'S offer of cash prizes amounting to a hundred dollars for suggestions along that line, is beginning to assume concrete form. The telephone pledge which is shown here forms one face of a little disc of cardboard, whose reverse bears the familiar imprint of the Blue Bell. A hole punched near the upper margin allows the disc to

be suspended from the telephone instrument so that its moral obligation will always be before the user. Presumably the American Telephone and Telegraph Company has distributed many thousands of these little reminders among telephone subscribers; and if there is any virtue in printer's ink, the appeal should not go unheeded. At any rate, the little cardboard emblem will have the good wishes of every telephone man.

Railway Telephone Construction

By J. C. Kelsey

FOR several years there has been an insistent cry for standard telephone apparatus. Every effort on the part of any organization toward this end has been met with opposition on the part of the various manufacturers, who seem to have the groundless fear that standard telephone apparatus means the output of one particular factory.

Standardization.—Such fears are not only groundless but foolish. Standardization does not involve apparatus as much as it does the arrangement of it. The demands of standardization are simple, because the consideration alone is balance. A balanced circuit simply means one which will resist extraneous disturbances and give the transmitting circuit the best possible path.

Transmission.—Transmission is divided into two general groups; the first, and possibly the older, is the magneto telephone or local battery method, the other is the common battery method, which came into vogue in 1898.

Local Battery Telephones.—Local battery telephones remind us of steam railroad conditions, in which each unit has its own power of motion. The two dry cells, working with the transmitter, constitute the locomotive feature.

Common Battery Telephones.—Common battery telephones remind us of electrical railway conditions, in which each motor unit is propelled by a central power. The transmitter, acting with the central battery, constitute the powerhouse and motor feature.

Rating of Systems.—Often managers of telephone companies, in changing from local to common battery, are disappointed temporarily, in the transmission. A local battery telephone, with new cells, may be rated at 100 per cent, for sake of comparison. The batteries run down enough to lower the local battery efficiency to 60 per cent. A common battery telephone will be constant, and stands in our relative scale at 80 per cent. It is plain that local battery telephones, newly equipped with batteries, are superior to common battery. You can prove it easily.

Wastefulness.—Telephone service, compared to all other wire transmissions is the most wasteful method. Of all the energy expended in the transmitter circuit but one-half of one per cent of it is available at the receiving end. But the telephone receiver is a most marvelously sensitive instrument and interprets the surviving electrical force as human speech, clear enough to be plainly understood. It teaches us that quality and not quantity is the goal we are seeking.

Classification of Local Battery.—Local battery telephones are divided into two general classes—series and bridging.

Series Telephones.—The series telephone has the usual standard apparatus, except the ringer and generator. The generator has a higher armature resistance and greater number of turns, while the ringers are wound to eighty ohms. On a series party line you are compelled to talk through the inductive resistance of eighty-ohm ringer coils. The damage to transmission can be avoided by bridging a one-half microfarad condenser across the ringer coils.

While the manufacturing output of series telephones equals the four-bar and five-bar telephones, the series telephone may be said to be an obsolete type, from a party line standpoint, because its circuit arrangement is not a balanced one, and it cannot cope with extraneous electrical disturbances.

Bridging Telephones.—The bridging telephone is an example of the survival of the fittest. The bridging telephone is put out with three, four or five bar generators and with 1,000, 1,600 or 2,500 ohm ringers. The standard average type is one equipped with a four-bar generator and a 1,600-ohm ringer.

The bridging telephone permits of a balanced line, and is thereby most fit for efficient transmission. There is nothing so disturbing to telephone transmission as a buzz or hum as of a distant dynamo. With a well-balanced circuit and insulation in good condition, there is no reason why a bridging line should not be absolutely quiet. We have examples of ordinary perfect lines being made noisy by the series alternating trolley system, and occasionally an accidental ground on the 2,200-volt circuit of the average small town lighting circuit makes all the telephones noisy. However, the latter effect is only temporary. It is a good rule to look up your paralleling power and lighting wires when your own lines are disturbed.

Condenser.—The great trouble with bridging party lines is that someone leaves the receiver off the hook, or too many listen, so that you can not ring the bells on the line. This is easily remedied by placing a one-half microfarad condenser in the receiver circuit. This little condenser automatically presents a high resistance to low frequency ringing currents, and a very low resistance path to the high frequency voice currents.

Special Receivers.—Do not waste your time on special receivers or go to the extra expense. The ordinary receivers range from 70 to 90 ohms, and there is very little to gain by increasing the windings. It is just as possible to overdo the thing as it is to do the opposite. The middle ground is usually the best. Furthermore, the replacement of a special receiver is difficult. Assuming that the special receiver is better, the replacement by a temporary receiver might offer an element of danger, due to poor hearing.

It is better to stick to standard devices.

Push Button.—The farm line usually serving twenty or thirty telephones, not only uses the condenser to help the ringing but goes further, and a push button is put in so that the exchange drop or bell may be secretly operated, and connection obtained without alarming all the line subscribers. With this arrangement every subscriber could be listening and it would not interfere with the signaling of the central office. The condensers help the subscribers to ring each other on such a line. As you have possibly heard, the farm ladies will tie the receiver to their ear so they may knit or peel potatoes, and still be familiar with neighborhood affairs.

Generator Armatures.—Three-bar series generators are wound with 330 turns of No. 34 wire and have 350 ohms of resistance.

Four-bar bridging generators are wound with 3,000

turns of No. 31 wire and have 150 ohms of resistance.

Five-bar bridging generators are wound with 1,500 turns of No. 30 wire and have 120 ohms of resistance.

The two latter are built for heavy work and will easily operate forty ringers on a long line.

Local Battery Transmitters.—For this work transmitters should have a comparatively low resistance and should average close to twelve ohms. One great manufacturing house made its reputation on an eight-ohm transmitter for this service.

You hear considerable argument for high-resistance transmitters for this work, but it is all a mistake. There are places where such practice is justified, such as a home where only short calls are made and it is important to save battery current, but in railway work any danger or risk of poor transmission due to effort to save battery would be nothing short of suicidal.

Types of Transmitters.—There are two general types of transmitters, the solid back and the so-called reversed type.

One prominent superintendent has compared the solid-back to a belted engine and generator and the reverse type to a direct connected set.

The reverse type simply incorporates the carbon cup directly in the diaphragm itself. Such a transmitter will not pack, as usage sets every particle into motion.

The oscillograph reveals that the reverse type or diaphragm cup type shows presence of tones not found at all in the solid-back. It is these extra tones that help voice recognition. Voice recognition is one of the prime requisites demanded by railway interests, particularly in train dispatching.

One dry cell connected to an eight-ohm reverse type transmitter will do as good work as three dry cells connected to a transmitter of 24 ohms or more.

Two dry cells connected to a twelve-ohm reverse type transmitter stands today as the standard of transmission.

Receiver.—The ordinary two-pole receiver, averaging 80 ohms, is the standard. Keep your devices of standard resistance. They are easy to interchange.

Either hard rubber or composition shells are used; composition shells are used exclusively by the independent trade.

Receiver Hook.—The device should be punched brass, as should all other parts. The use of steel and white metal should be prohibited where brass can be utilized.

Ringers.—As railroads will use copper for long-distance service and iron for short-haul work a ringer working its best at 15,000 ohms should be standard. Ringers adjusted for 60,000 and 80,000 ohms will not ring so well.

Generators.—The generator bars should be carefully rolled by suitable machinery, so that the fibres of the steel will be preserved. It is well known that careless bending of steel will prove ruinous to its electrical and magnetic properties.

The armature should have the smallest air gap consistent with good mechanics.

Lightning Arrester.—A simple lightning arrester should be used, either on the telephone or near it, on account of the feature of contributory negligence being held against your company. You know everybody considers a railroad a just victim. People want railroads to come to them and make their property valuable, and then want them to support them too. Too much attention can not be paid to the question of lightning protection.

Induction Coils.—The subscriber's induction coil should have a primary winding averaging .35 ohm and the secondary of 35 ohms. The winding should also be impregnated with paraffine in vacuum. This will help to resist burn-outs from diverse causes.

The operator's induction coil has a primary winding of .35 ohm and a secondary winding of 200 ohms. The high resistance of the secondary is necessary, because the operator would otherwise have a bad cutting down effect when listening in on a conversation.

COMMON BATTERY TELEPHONE SYSTEMS.

There are two general classifications: the repeating coil system used by Bell interests and the retardation-condenser method used by the independent interests.

The repeating coil method may be properly called an "electromagnetic system," while the retardation-condenser system may be described as the "electrostatic method."

There is no difference in transmission between the two systems.

Toll Connection.—Common battery systems connect with long-distance lines by means of a repeating coil and condenser arrangement. This recalls the well-known law that telephone systems of different characteristics should only be in inductive relation; otherwise balance will be distributed and other disturbing factors will enter in.

Some systems use 40 volts, some 30, others 22 and 20. The results are identical, as each system equalizes the resistance of its retardation coils. These retardation coils individualize the circuits, and thereby prevent cross-talk.

Battery Supply on Toll Connection.—In toll connection it is customary to increase the amount of battery flow to subscribers' telephones. In other words, the local subscriber talk does not require as much current as the long-distance connection.

Common Battery Transmitter.—The average resistance of the common battery transmitter is 100 ohms.

PARTY LINE SELECTIVE RINGING.

If a terminal switching system is desired and economy of wire space is necessary the harmonic system of selective ringing is recommended.

The harmonic system makes use of four frequencies: $16\frac{2}{3}$, $33\frac{1}{3}$, 50 and $66\frac{2}{3}$ cycles per second.

The ringers are of the polarized type, and the attunement is effected by different weights of bell tappers.

Four full metallic stations can be used without any interference between stations.

If it is found that eight stations are necessary the earth can be used as a return, and each of the eight stations can be called without disturbing the others.

This system has been in use for two years in the Rock Island yards of Chicago, and the switchboard being placed in a central position, made some most remarkable wire economy.

The harmonic selective system is, of course, confined to telephone switchboard service.

TRAIN-DISPATCHING TELEPHONE APPARATUS.

Such apparatus is necessarily confined to long lines, and the service somewhat resembles a heavily loaded party line. It is essential that such service be selective.

The apparatus for transmission purposes is the standard apparatus used by telephone companies.

Such systems must be of a bridging nature, since

any series arrangement for telephone purpose is foreign to modern demands. Not only does a series arrangement have a bad effect upon transmission, but there is an added danger from lightning destruction. Each side of the apparatus has to be protected.

The bridging system is the outcome of years of experience, and stands as a climax, not only in telephone matters but in all electrical usages.

Conclusion.—The present methods of wire transmission can hardly be said to be permanent. Some day devices will be made which will deal with more tangible current values, and step-up and step-down methods can be made use of. We are approaching nearer a real long-distance power proposition, where we can raise pressure values and lower them and offset the effects of capacity just as in power practice an over-excited synchronous motor offsets impedance.

Electrical engineering deals with currents of one frequency, either 25, 33, 40, 60 or 133 cycles per second, but in each case always singly.

Telephone engineering deals with electrical currents of many frequencies, each one acting individually and separately, and each one performing its own particular duty.

When one imagines all frequencies, ranging from 50 to 5,000 cycles, surging along as electrical currents, he has reason to wonder how any intelligible sound can be carried.

The higher frequencies succumb to the capacity of the line more readily than the lower ones, hence conversation through commercial cable is limited to 35 miles and 1,200 miles on open wire because of the fact that these numerous currents do not finish as they start. In other words, they become distorted. Hence the failure to recognize voice or to interpret speech.

To overcome this the Bell interests use a Pupin coil, which is a device for offsetting the distributed capacity of a telephone line by means of distributed impedances, thereby giving the lower frequencies the same chance to finish as the higher ones.

However much opportunity is offered for improving telephone apparatus, and however much revolutionary invention the mind can contemplate, we may be assured that voice transmission is the final and highest point in the evolution of communication.

McMeen on Cable Corrosion

In a recent discussion of electrolysis of cables before the San Francisco branch of the A. I. E. E., S. G. McMeen said:

"The problem of protecting a system of underground pipes, such as telephone cables or the like, from electrolytic corrosion is not a simple one. It does depend, however, on a simple, natural law. The complexity of the problem arises chiefly from the scattered nature of the things which cause the trouble and the things which suffer from it.

"In reaching a practical solution for the protection of a telephone cable system, for example, the chief aim needs to be a determination of the differences of potential between the telephone cable sheaths and everything else. If all of the places where a positive potential on a cable sheath causes current to leave it can be arranged so that the leaving is wholly over a solid conductor, electrolytic damage may be prevented. And if such a system of correction does not introduce another in the way of actually overheating the cable sheaths by passing too much current through them, a solution may be said to have been reached.

"Co-operation between the management of traction systems and pipe-using systems is as important, it seems to me, as an activity on the part of the latter systems to protect their own underground conductors. Information upon the general practices of traction companies discloses a wide variety of states of mind with reference, at least, to the degree of responsibility the traction companies think they ought to bear. I am convinced that the solution of these problems will become simplest when co-operation has been more nearly perfected.

"I have in mind an instance wherein a traction company, a telephone company and a municipality co-operated in nearly an ideal way. The interest of the city arose from its ownership and operation of a water system. The general plan of action having been determined before anything else was done, a system of protection was installed and has been found satisfactory to the interests having pipes which might have suffered, although the plan was inaugurated more than fifteen years ago.

"Speaking generally, it may be said that the traction companies have contributed but little in the way of assistance toward either protective or preventive measures. In a very few instances, preventive measures have been utilized, and, so far as can be seen, with the result of lightening the burden upon the pipe-using companies in a great degree. It is my present opinion that the burden upon the traction company using preventive measures often may be found much less than the burden of protective measures which otherwise would have rested upon the pipe-using interests. If inquiry could show that this always is true, the only economic conclusion would be the increase of preventive means, however the actual cost of the preventive measures might be distributed among the interested concerns. It is only a case of determining what really is best, after a full analysis, as against starting with controversy as to who shall pay the cost.

"Most discussions of this subject seem to be suggestive of the question of rail bonding, and frequently, in lodging a complaint concerning electrolytic corrosion, an attack is made upon the quality of the bonding of the tracks. It has not seemed to me that the relation between corrosion and bonds is so close as it may have seemed to others. In many cases, for example, the virtue of the general bonding scheme may be left out of consideration without affecting the character of the general preventive or corrective measures. One can recall cases wherein negative feeders, rail bonds and rail joints have been treated in broad ways independent of each other, with results approaching the best.

"A recurrent agitation probably familiar to all of us is that of the alleged probable destruction of steel and reinforced concrete buildings, due to electrolytic corrosion of underground metal portions. I am sure we should all be entertained by any testimony of a practical nature as to when certain of our new and presumably excellent San Francisco buildings shall fall for these reasons."

Fire Alarms by Telephone

In Chicago about 90 per cent of all the alarms of fire are sent to the fire department first by telephone and later, if there is a fire of any magnitude, by "pulling" a fire alarm box. The telephone company sends monthly reports of these telephone fire calls to the chief of the fire department, and in general keeps in close touch with the department in the matter of transmitting alarms.

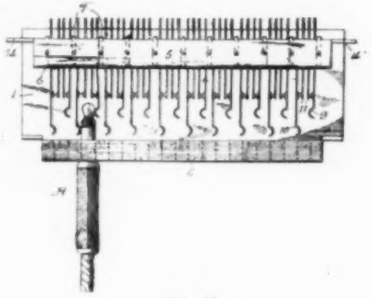
Recent Telephone Patents

By David S. Hulfish

It will be the purpose of this department to list all United States patents, as they are issued, which pertain to any branch of the telephone business, giving such data in each case as will enable the reader to judge whether he wishes to see the complete drawings and specifications of the patent. When patents of special interest to TELEPHONE ENGINEER readers are encountered, the descriptive matter herein will be amplified accordingly. A complete copy of drawings, specifications and claims of any patent listed will be furnished from this office upon receipt of ten cents.

926,831. Telephone Jack. A strip of jack is built up by mounting a row of sets of jack springs upon a base plate. A backing strip holds all of the jacks firmly in position. By shifting the locking strip, any one of the jacks may be removed. Alfred L. Sohm, Whittier, California, assignor to National Electric Works of same place.

926,906. Distributing Bracket. A yoke is attached to the pole and holds a transverse rod upon which are strung a number of insulator knobs. From such a bracket a number of pairs of drop wires may be run, the bridling passing from the distributing bracket to the cable terminal of the pole or to the open wires. Albert L. Stadermann, Terre Haute, Indiana.



926,831.

926,937. Wireless Telephony. Circuits for a set of transmitting apparatus have a plurality of transmitters and primary circuits, all effective through the same secondary to the transmitting antennae. Lee DeForest, New York, New York, assignor to De Forest Radio Telephone Company, of same place.

926,950. Ringing Circuit. The object is to provide apparatus for ringing a subscriber's bell intermittently until the call is answered, then for removing the ringing apparatus from the cord, connections permanently. A thermal relay is used for the final change. Ray H. Manson, Elyria, Ohio, assignor to Dean Electric Company, of same place.

926,951. Hookswitch. A detachable hook lever engages a returning spring which in turn engages and operates the switch springs. Ray H. Manson, Elyria, Ohio, assignor to Dean Electric Company, of same place.

926,994. Automatic Connector Test. When a subscriber in an automatic exchange has two or more telephones, as for instance a private branch exchange having several trunks it is desirable to test all of the trunks by the automatic connector. Mr. Molina provides two busy-test contacts and two busy-test wipers, using a selected one for single lines and for the final line or trunk of a group, and using the other of the busy-test contacts for trunks before the last one. Edward C. Molina, Arlington, Massachusetts, assignor to American Telephone and Telegraph Company, of New York, New York.

927,025. Call-Distributing System. A circuit is shown by which the answering plug of the operator's keyboard is dispensed with and is replaced by automatic devices for connecting a calling line directly to the connecting and ringing plug of a manual switchboard. Sidney H. Browne, Pittsburg, Pennsylvania, assignor to American Telephone and Telegraph Company, New York, New York.

927,032. Cable Hanger. A strap metal hanger with hooks for uniting the ends after the hanger has been passed around the cable and messenger. John E. Feiock, Martins Ferry, Ohio, assignor to Emil Nortemann, Wheeling, West Virginia.

927,166. Self-Soldering Cable Joint. A form or mold containing solder is placed over the cable ends and heated until the solder melts. William Reid, Chicago, Illinois.

927,230. Dictograph. A system of office circuits and apparatus for handling the dictation of correspondence by telephone. W. F. H. Germer, New York, New York, assignor to General Acoustic Company, same place.

927,367. Wall Plug. A spoon-shaped piece of metal for driving into the wall, has a wood block for screw or nail after the wall plug is set. Frank M. Marshall, Los Angeles, California.

927,375. Selective System. Selection is attained by a relay whose general nature is that of a voltmeter, the index hand of which may close the substation circuits. Nathaniel C. McClure, Healdsburg, California.

927,395. Transmitter. A telephone transmitter of granular-carbon type constructed particularly for handling either high-tension or low-tension currents. Charles Adams-Randall, New York, New York.

927,413. Induction Coil. One head is provided with binding posts and the other head with clips for engaging desk-stand terminals in a readily removable engagement. Albert K. Keller, LaFayette, Indiana, assignor to Sterling Electric Company, of same place.

927,414. Telephone System. In connection with a telephone system, a system of fire alarm circuits and apparatus permits telephonic and telegraphic fire alarm service over the phantom of the line. John M. Latimer, Flushing, New York, assignor to Consolidated Fire Alarm Company, New York, New York.

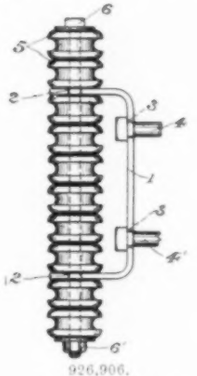
927,455. Selector. A central-office switching device for selecting among a group of telephone circuits. Ernest A. Faller, New York, assignor to North Electric Company, of Cleveland, Ohio.

927,470. Telephone System. Line circuit for a divided multiple switchboard. Two line lamps are provided for each line and either may be lighted from the substation. William Aitken, Muswell Hill, England.

927,643. Mouthpiece. An enameled sheet-metal mouthpiece has a portion of reduced size carrying threads. William W. Dean, Elyria, Ohio, assignor to Dean Electric Company of same place.

927,651. Selective System. Rotating time discs are provided at the substations and are released selectively. A station is locked out from use of the line while its time disc is rotating. Henry G. Guyle, Sargent, Nebraska.

927,663. Selective System. In connection with a harmonic selecting system a hand generator is provided. Ray H. Manson, Elyria, Ohio, assignor to Dean Electric Company, of same place.



926,906.

927,664. Key. A combined ringing and listening key. Ray H. Manson, Elyria, Ohio, assignor to Dean Electric Company, of same place.

927,739. Relay. Both core and armature are mounted within the helix of the relay. Ray H. Manson, Elyria, Ohio assignor to Dean Electric Company, of same place.

927,816. Selector. A step-by-step substation device for selective signal and lockout telephone lines. Charles H. Sider and Lloyd D. Smiley, Uniontown, Pennsylvania.

927,817. Hygienic Attachment. A cone of sheet material, to be placed within the mouthpiece funnel. Eliza C. Smith, Washington, District of Columbia.

928,096. Transmitter. A device of the corn-plaster type with the felt ring supported by a flexible disc forming substantially a secondary diaphragm. Giuseppe Angelini, Rome, Italy.

928,104. Relay. A plurality of armatures are provided and are adjusted to be responsive to different line currents. Edward R. Brodton, Mobile, Alabama.

928,115. Meter. A time meter for substation telephone and controlled by the switch hook. Richard M. Eoton, Niagara Falls, New York, assignor to Dean Electric Company, Elyria, Ohio.

928,171. Automatic System. An arrangement of circuits and apparatus in an automatic private branch exchange. Mauriz Baumer, Nuremburg, Germany.

928,188. Coin Collector. An outside manual lever shifts the deposited coin to a position whence the central office operator may pass it further to the coin box by electromagnetic control if so desired. Charles S. Ellis, Chicago, Illinois, assignor to American Coin Register Company, of same place.

928,245. Meter. An automatic substation of the Strowger type is equipped with a manually operated meter which has limiting conditions requiring its operation at the proper time. Henry P. Clausen, Chicago, Illinois.

928,373. Sanitary Attachment. A sanitary guard of elastic material having its outer edge reinforced for engagement with the telephone mouthpiece and conforming closely to the shape of the internal surface of the mouthpiece. Sidney E. Florsheim, Chicago, Illinois.

928,651. Transmitter. A cup-shaped concentration for sound waves is attached to the diaphragm. Felix Gottschalk, New York, New York.

928,652. Transmitter. In the carbon cell the granular carbon is divided by partitions into separate quantities. Felix Gottschalk, New York, New York.

928,680. Telephone System. A group of subscriber's lines is connected with a manual switchboard by trunks fewer in number than the subscriber's lines. A switch upon each trunk enables any subscriber to reach the central office or an operator to call any subscriber. David W. May, Kansas City, Missouri.

928,862. Telephone Set. A portable equipment of transmitter, receiver and switch built within a watertight case. Edwin A. Graham, Brockley, London, England.

929,025. Attachment. An extension frame for the vertical column of a desk stand is arranged to support the receiver when in use. Charles R. Schafer, Syracuse, New York.

929,128. Attachment. In a desk stand, the transmitter yoke holds a transverse arm supporting the transmitter at one end and the receiver at the other. Howard F. Hansell, jr., Philadelphia, Pennsylvania.

929,404. Attachment. A wire frame attached to a desk stand column supports the receiver upon a hinged extension which also operates the hook lever to operate the switch. Benjamin E. Detrick, New Albany, Indiana.

929,629. Coin Collector. A coin box having both audible signals and registering devices, the registering devices being so arranged that the deposit of a succeeding coin registers the last preceding one. Frank D. Powell, Chicago, Illinois, assignor to American Coin Register Company, of same place.

Wood-Saving Processes

The following information concerning the processes of wood saving in Europe is furnished by Consul-General Robert P. Skinner, of Hamburg, in reply to an inquiry from an Ohio company:

Various methods of applying preservatives to railroad ties and telegraph poles have been in practical use in Europe for more than thirty years. Considering the simplicity of the processes and the positive results achieved, it is little less than amazing that so little attention has been paid to the subject in the United States. It would be difficult to find in any advanced European state a single railway, telegraph or telephone line the ties and poles of which have not been impregnated with an antiseptic composition. Figures are published relating to 20 German telegraph lines, the impregnated poles of which were set at various intervals from 1877 to 1893. Of those set in 1877, 30 and 38 per cent were still sound and in use after 26 years' service, and of those set from 1891 to 1893 there are records of five lines upon which 100 per cent of the poles are still standing. The Bavarian postal service, after 30 years' experience, certifies that the known average life of impregnated poles in Bavaria is 17½ years, and the German imperial administration calculated in 1903 that the known average life of such poles was 16.08 years. In the meantime the work of impregnation is being more perfectly performed, so that future statistics will show much better results.

In France, the Eastern Railway Company announced in 1889 that in the 24 years preceding 67 per cent of its untreated oak ties had been replaced, while only 16 per cent of such as had been treated with creosote had been removed. Beech ties properly impregnated, according to the chief engineer of that road, have an average life of 35 years. More recent conclusions reached in the same were to the effect that 80 per cent of creosoted beech ties were good after 27 years of service, while only 54 per cent of oak ties, treated in exactly the same manner, were good after 24 years of service.

The results of impregnation are so conclusive and undisputed that it would be futile to present further details on the subject. In recent years the most usual preservative agents in use have been chloride of zinc, creosote and bichloride of mercury, applied by imbibition or by impregnation by injection forced by the pressure of the air. This second method of treatment generally consists in placing the wood in closed metallic recipients from which the air is pumped, and the liquid then introduced under high pressure.

Until comparatively recently it was very common to treat wood by injection under pressure of chloride of zinc diluted with water. While this antiseptic is efficacious it loses its qualities and becomes hygroscopic. To overcome these disadvantages creosote was added to the mixture, and under the title of "mixed impregnation" this system has been adopted for the treatment of white-wood ties, which are too cheap to warrant the use of creosote alone. Hard-wood ties, on the other hand, are impregnated with creosote alone, the general effect of which is to close the pores, coagulate the sap and kill the micro-organisms in the wood.

The use of creosote alone is quite unusual in the treatment of telegraph and telephone poles, because of the odor, tendency to melt and run under the sun and objections raised by linemen. It is common, therefore, to use bichloride of mercury (the French government uses sulphate of copper), the efficacy of which has been known since the middle ages, when it was used to combat decay and the action of insects. At the Himmelsbach plant, near Freiburg, Baden, this is used in 66 per cent solution. The wood is plunged into timber or cement recipients and there remains from ten to fifteen days. In this plant, moreover, treated poles are given a special coating of some unknown antiseptic, which extends about two feet above and two below the point where the pole enters the soil. This application protects the part where the variations in humidity commonly attack the pole. In the Himmelsbach establishment there are tanks for the impregnating of 40 ties at a time under pressure, these tanks being 20 meters (65.6 feet) long and 2 meters (6.6 feet) in diameter. Their baths for treating telegraph poles are 98.4 feet in length.

What Makes a Good Farmers' Telephone

By O. N. Livermore

THE function or object of any commercial telephone is a means of communication by speech or conversation. Therefore, the transmitter, receiver, induction coil and batteries—the part of the apparatus through which the talking is done—should be given first consideration.

The transmitter comes first and is the most important part of the talking apparatus. A good receiver cannot repeat from a poor transmitter.

The heart of the transmitter is the carbon, and it is essential that the carbon should be the most carefully selected material entering into the construction of the telephone; and that the source from which the carbon is selected is one that has been given a thorough investigation and a mineral vein that has proven out its reliability.

It is also essential that the transmitter be one that will require a uniform battery consumption and will consume the minimum amount of current. This does not necessarily mean a transmitter that can be operated with two batteries instead of three; any farmer can appreciate it is more economical to plow with three horses than with two, and the same is true of the batteries in the telephone. Both the horses and the batteries have a certain amount of work to perform, and the ones that last longest and do the most work usually prove to be the most economical.

The object of the transmitter is to convey the voice of the person talking to the end of the line, and the transmitter that will convey the voice in its most natural tone and most distinctly the longest distance can be considered the best transmitter. It is not a noise that is to be conveyed—the noise should be avoided. One of the leading manufacturers of telephones has spent a fortune to overcome the noise passing through the transmitter; the nearer you can come to confining the transmission entirely to the words spoken directly into the transmitter, the more perfect the telephone conversation will be.

Therefore, the most sensitive transmitter, like the most sensitive and high spirited horse, is not the best for business.

In addition to the talking qualities, the transmitter should be substantially built, but not cumbersome, and should harmonize in appearance with the balance of the set.

A good transmitter is useless without a good receiver. The permanent magnets, pole pieces and diaphragm are the important and essential parts of the receiver. The magnets should be made only of a selected special grade of steel and the pole pieces of a special annealed Norway iron.

The ear piece should be so designed as to fit the ear snugly, and the oldest and largest manufacturers have made a study of the design; and this part of the receivers of such manufacturers will be found very nearly alike.

As a rule, the transmitter and receiver are generally purchased in pairs and the manufacturer of the best transmitter will usually have a high class receiver.

The batteries are an important part of the talking equipment. The cheapest battery is not always the most economical, nor is the battery showing the greatest initial strength the best to use or the cheapest to buy. The tests to which some batteries are subjected by the use of pocket meters is at the best unreliable, as it is very difficult to get these instruments reading accurately. Successful transmission requires a uniform and constant current; and, again, the simile can be used that the runner who shows the greatest strength and speed at the beginning of a Marathon race is not the one who is certain to win; more likely it is the one who knows his distance, best times himself to a uniform gait and makes no useless exertion.

The largest telephone companies and the telephone manufacturers have studied the battery question for years, and they do not buy, nor do they recommend, batteries that are cheap in price. The safest rule is to use a telephone battery for telephone purposes, and buy it from a telephone manufacturer whose product stands the highest on the market.

In addition to the talking equipment, the signaling apparatus should be dependable. This apparatus consists principally of the switch hook, generator and ringer.

The hook should be compact, self-contained and substantial but not clumsy; all of the contacts should be of the best grade of platinum and all the springs mounted vertically so no dust can settle on the contacts but will fall through the springs.

The generator for distances of five miles and over, with more than five instruments on a line, should be a five bar generator of heavy substantial construction, with large bearing and one in which the crank and armature will turn easily, even on the heaviest loaded lines, so as to distinguish readily the various code rings. The latest sets placed on the market will operate satisfactorily on lines 30 miles long with 40 telephones on the line, and in the case of one manufacturer the telephone has been worked on a line 75 miles long with 75 sets on the line; but this is going considerably beyond what the manufacturer recommends.

The permanent magnets of the generator should be made of specially selected steel and the armature normally short-circuited to give it protection against damage by lightning.

The ringer should be sensitive, very easy to adjust, and one that will stay adjusted. The one that can be adjusted with an ordinary screw-driver with one or two simple turns is the best. The resistance of the ringer should be 1600 or 2500 ohms, some manufacturers claiming 1600 ohms is the best and others that 2500 ohms will operate equally as well. Care, however, should be taken that the ringers on the same party line should be of the same resistance; that is, telephones containing 1600 ohm ringers should not be operated over the same party line with telephones containing 2500 ohm ringers.

The gong posts should be mounted on the ringer frame and not on the woodwork of the set.

Large brass gongs produce the greatest volume of sound. After long experience and careful study by the most competent engineers for one of the leading manufacturers, a gong three inches in diameter was found to be the best size. In purchasing a telephone there is this distinction to be remembered, that the function of

the ringer is to attract attention and the function of the transmitter is to convey conversation and not noise.

The woodwork of the telephone should be attractive, and it is generally furnished in oak. It should be well put together.

The door should open to the left so that when inspecting the set and adjusting the ringer, the generator can be turned and the operation of the ringer watched at the same time.

The writing shelf, generally composed of two pieces, unless reinforced with dowel pins between the two pieces, is likely to break off.

The backboard should be slotted the entire length so the lines can be brought in from the top or bottom.

It is preferable to have all binding posts inside, so the telephone cannot become short-circuited by having scissors or other metal articles laid across the binding posts.

The telephone should be protected by a lightning arrester, and this arrester should not be mounted on the telephone. The object of the arrester is to protect the telephone and the person who may be using it during a storm, and the greater distance this arrester is placed from the set and the nearer to where the lightning is likely to enter the building on the line, the more certain is the protection. The usual place is just inside the window casing where the wires enter the building. Care should be taken that it is placed far enough away from the lace curtains to avoid damage from their catching fire. This practice of mounting arresters is followed by all of the leading companies in the large cities and is the standard practice.

It should be remembered that the telephone is a wonderful, delicate and useful instrument. It has required years to perfect it as it is today, talking over a distance of more than 1,500 miles, and that the most dependable and best instruments are those sold by the oldest and largest manufacturers, and that a prospective purchaser will always get the best bargain if he trusts to the experience and reputation of a manufacturer in preference to attempting to use his own judgment in selecting from the various makes he finds on the market.

New Exalted Order of Telephone Men

J. C. Casler, former manager of the Forth Worth Telephone Company; J. B. Trescott and Aaron Smith, of Fort Worth, have been elected officers of the Knights of the Shield, an organization of independent telephone men formed at Dallas, Tex.

The new order will be to the independent telephone men what the Hoo Hoos are to the lumbermen and the Knights of Bovinia to the cattlemen.

The new organization, which was formed at a meeting at the Chamber of Commerce, is expected to spread through the United States and Canada.

Officers of the organization are grand inductivator, exalted buzzerjop, supreme condenser, wire chief of the universe, transpositor, megohm, ampere. In ordinary life they are respectively as follows: J. C. Casler, H. D. Eberle, T. A. Gould, C. A. Shock, J. B. Trescott, D. C. Lingo and W. S. Upham.

In addition there are the following: Trouble shooters, E. M. Chamberlain, H. B. Bomar, A. A. Marrs, Aaron Smith, Jack Milburn, W. S. Kingsbury and J. L. Norman.

The temporary officers who served in the meeting Saturday were E. M. Chamberlain of Greenville and J. B. Trescott of Fort Worth.

Aaron Smith, who returned Saturday night from the meeting, and who has been one of those active in the formation of the order, says it is not intended to supersede the Texas Independent Telephone Association, but rather act as an auxiliary to it. The latter organization was formed in Dallas nearly five years ago, and has attained considerable proportions, and the new one, it is stated, is intended to supply some new features which will add greatly to the interest of the annual conventions.

The proposition has been discussed by independent telephone men throughout the state for some time past, and yesterday's meeting was the culmination of the discussion. After going thoroughly into the matter, permanent organization was effected and officers elected.

The following committees were appointed:

Constitution and By-Laws—Aaron Smith, J. C. Casler, C. A. Shock, T. A. Gould and H. D. Eberle.

The committees will have everything in readiness for the first general telephation, which will be held in Dallas some time during October. It is predicted by the knowing ones that this first induction of the innocent wanderers into the mysteries of Knights of the Shield will be equal to a five-ring performance of the world's greatest shows.

From the time the "invisible conductor" passes the wanderers through the outer gates until they have stood the test of ductility on the "relay rack" and have been led into the sacred inner courts of the temple by the "grand inductivator," there will be "capers cut before high heaven" never dreamed of by the performers.

Protection Demanded for Linemen

A petition signed by electrical workers of South Bend, Ind., has been filed with the city council asking for the improved methods in electrical construction and better protection for the linemen.

The petition asks that all high-tension wires be placed on yellow cross-arms; primary and arc light wire on black cross-arms, and low-voltage wires, such as telephone, telegraph, police and fire alarm, on red cross-arms. Where high and low-voltage wires are on the same poles, the petition asks that a clearance of six feet be made. All cross leads should have a clearance of four feet with proper guards. High-voltage wires should be placed on the tops of the poles and no street railway lines should carry more than 1,000 volts on their wires. The petition cites the great number of incidents where electric workmen had been electrocuted and little or nothing done to better conditions.

Demagnetization of Permanent Magnets

A paper recently presented by Prof. S. P. Thompson and Mr. E. W. Morse before the Physical Society, England, brought out some interesting facts about the demagnetization of bar magnets. They showed that every bar magnet has a self-demagnetizing action, the value of which at the middle of the bar depends for a given intensity of magnetization on the ratio of the length of the bar to its cross section, on the permeability and on the surface distribution of the magnetism. It was found that for equal values of the dimension ratio the factor for rectangular bars having a sectional ratio of 2 to 1 was about 93 per cent of that for bars of square section, while for flat bars having a sectional ratio of 10 to 1 the factor was 75 per cent of that for bars of square section.

Instruction in Telephone Engineering

By G. S. Macomber

THE first instruction in telephone engineering was given in 1877 by Professor Alexander G. Bell and associates. General lectures were given in many large cities in order to rapidly educate the public in the use of the telephone. Detailed instructions of an elementary engineering nature were given to those agents and assistants who were to direct the installation of the telephone instruments and lines in their corresponding section of the country. Before that time each person obtained knowledge about the telephone by investigating for himself. At this time, in order to assist the newly formed company in the exploitation of its apparatus, data of all kinds pertaining to the installation and use of the telephone were collected and disseminated. For a short time keen competition brought about similar bureaus for the collection and dissemination of telephonic information, but this died out in the course of a few years and the Bell companies became the sole custodians of the knowledge of practical construction and operation of the telephone. During the period from 1877 to 1893 modern telephone engineering began, and when the fundamental patents expired in 1893 there was a great rush into the telephone manufacturing and operating fields. This created a demand for men who knew about practical telephone work, both from the so-called "independent" and the "Bell" companies, the latter needing new men to take the places left vacant by older men who had joined the independent ranks. Between 1893 and 1898 many telephone, operating and manufacturing companies went through the process of reorganization in which an engineering department was formed. As a result, the duties of the telephone engineer increased considerably. Since the number of men who had a practical knowledge of the subject was very limited, the field offered a fine opportunity for technical graduates, and many of them took up this work. The number of men to take up this branch of engineering work increased so rapidly that the professors concerned began to consider the advisability of special instruction in telephony.

A year ago an inquiry was made among some Cornell graduates now in the telephone field in regard to their ideas of the proper kind of instruction in telephony for engineering students. Among other suggestions an invitation was received, through the influence of Mr. N. M. MacLeod, '07, from Mr. F. A. La Roche, division plant superintendent of the Philadelphia Bell Telephone Company, to visit and inspect its school for the instruction of employees in the maintenance and installation departments. The invitation was accepted and two days pleasurably and profitably spent in the inspection of this interesting school where, through the kindness of Mr. La Roche every facility to make a complete study of the details was offered. The following is an extract from a report giving the results of this study.

By way of introduction it may be said that the Bell Telephone Company of Philadelphia, established its school three years ago as the result of a sympathetic strike of its construction men. As the strike developed suddenly it became necessary to teach new men how to do the work left by the strikers. Young men were secured and given lessons in line construction, cable splicing, etc., and then sent out to make repairs. Within one week from the beginning of the strike the telephone company was able to take care of its work, and after a short time the strike broke up. Before the temporary school thus hastily established was closed it became evident that it would pay to extend the instruction and increase the facilities. This was done; and now after three years' trial it is considered a very profitable investment for the company.

There are at present two schools, one for installers, and one for maintainance men. The work of each is the same in general but differs in its details. The men who enter these schools are from the working force of the company and are under regular pay just as if they were doing the work of their respective departments. In the aggregate they devote six weeks, more or less, to the school work. Many of the men who take this work have never seen a book on algebra or geometry, and others do not have a knowledge of fractions or proportion. It is therefore necessary to give a drill in elementary mathematics to enable the student to solve the most elementary electrical problems.

Primarily the object of the school is to make the men more valuable to the company and accordingly the work is so conducted as to produce results as rapidly as possible. Although a part of the instruction given would be of value to the students in understanding other branches of telephone work, essentially it is directed toward maintenance and installation. The instruction is not intended to cover the telephone field broadly, but goes into every detail that is necessary to enable the men to locate the cause of, and to repair, with maximum speed and a minimum injury to the apparatus, troubles which develop in the particular types of apparatus used.

The physical equipment which is used by this company is limited strictly to apparatus of certain types that is manufactured by the Western Electric Company. There is no magnetic telephone apparatus in the school, this type not being used in the Philadelphia District. The maintenance school equipment consists of a standard type power switchboard, duplicate ringing machines, duplicate pole changers, storage batteries, mercury arc charging set, main and intermediate distributing frames, relay rack, fuse panel, resistance frame, one three position section of a No. 1 Western Electric telephone switchboard, there being one "A" position, one "B" position, and one "trouble" position, each with corresponding shelf equipment. The face equipment of this board is about 500 multiple jacks arranged specially for instruction purposes; one standard No. 9 board having three positions each equipped with ten cord circuits; one "P. B. X." (private branch exchange) switchboard with a capacity of twenty-five lines; one wire chief's desk equipped with three plugging up lines with visual signals, three cord circuits, one test circuit, two order circuits, two incoming trunks, and two outgoing trunks. In addition to this regularly formed equipment there are about twenty sets of apparatus wired to special terminals and mounted on box frames for detailed circuit study. Besides the above apparatus in the maintenance school there is a somewhat similar equipment for the installers' school, and also many small ingenious pieces of apparatus too numerous to mention here in detail. The equipment in these schools has

been built up gradually at an aggregate cost of approximately five thousand dollars.

The result of a study of the above conditions may be summarized as follows: With a very complete equipment, first class instructors, and the equivalent of one hundred laboratory periods of three hours each, the result produced in the above schools is a highly specialized training giving the student a microscopic view of a very small part of the modern telephone ssytem. For the plant department of the telephone company this result is very satisfactory, but for the university course it would be very decidedly out of place. University students with the same physical equipment and amount of time would get much more out of the work. However, after considering the way the work should be modified to meet the needs of a university course it becomes evident that any system of elaborate telephone experiments, would be a serious waste of time for university students.

The methods of, and the equipment for, telephonic instruction at Drexel Institute were also studied. There the work is taken up from the standpoint of the trade school. It may be described as slightly less highly specialized than the above, yet still not treated broadly. Later study of the methods of telephonic instruction at other schools and some colleges lead to the conclusion that there is a strong tendency in the same direction, namely, toward too much specialization.

During the past few years there has been considerable discussion among college professors and also among practicing engineers as to the education of electrical engineering students. Papers on this subject have been presented and discussed at the meetings of the American Institute of Electrical Engineers, and the Society for the Promotion of Engineering Education. A great variety of opinion was expressed at these meetings, but there is a decided leaning toward the belief that the university course could be less specialized, that it should train the students to look at things broadly and that the kind of knowledge given should be such as would apply to all kinds of engineering. Some engineers think that only a degree of Bachelor of Engineering should be given for undergraduate study. The following quotations are from the discussion of papers presented at the June, '07, meeting of the A. I. E. E.; they express the growing opinion of practicing engineers regarding engineering education. Mr. L. D. Nordstrum says: "It is my opinion that a man has never finished his education; his entire life is that of a student. His university years are merely his starting or foundation years." Mr. J. J. Carty, who is probably the most noted telephone engineer today, speaking in regard to the technical graduates who have entered the telephone field under his direction, says: "As a rule men are well trained technically but are often very defective in respect to that broad and liberal training which should underlie the technical education of every professional man."

The above statements were intended to apply to the complete four year electrical engineering course, but it is believed that they can be applied to the short specialized telephone course. The following requirements of a course of instruction for telephone engineers are suggested. The general course for telephone engineers should not be too highly specialized, but of a very broad and general character, including among the general engineering subjects such allied subjects as patent law, economics, architecture. The special telephone instruction should be given in a course which must be short, in order not to take too much time away from the general engineering studies; should not aim to teach that which can easily be learned in the first few weeks or months of practical work; should include statements giving practical advice as to what non-electrical parts of his technical course will probably be found of greatest importance in practical work of the telephone engineer. The keynote of the course should be an accurate resume of the fundamental principles involved in the operation of telephonic apparatus, and in the organization and management of the telephone system as a whole. This should be so thoroughly treated that the student understands fully, then he will not soon forget. To accomplish this a few illustrations from practice should be carefully studied. The subject matter should be so presented as to develop reasoning power and interpretation of engineering data.

With the above facts in view instruction will be given at Sibley College in telephone engineering during the coming term through a small number of senior students. The work will consist mainly of lectures, sometimes illustrated with lantern views, sometimes experimental and with occasional inspections of practical telephone systems. A trip to one of the larger cities may be undertaken to impress the relative proportions of the telephone system. Telephone laboratory work sufficient to give the student a general idea of the method of operating a telephone switch-board and the essential features of a common switch-board circuit, has been arranged in the regular electrical laboratory course for all electrical engineers. Therefore this will not be taken up in the special course for telephone engineers. They will devote some time to a more detailed study of single pieces of apparatus in order to gain a thorough knowledge of principles of operation, limitation, etc. In addition some special engineering research will be offered to those who are prepared to do such work efficiently.

It is hoped and believed that this system of instruction will give students a broader conception of telephone engineering and a more thorough knowledge of the fundamentals.—*Sibley Journal of Engineering.*

Wireless on Trains

The Union Pacific railroad at Omaha will be the western pioneer in experiments to show the applicability of wireless telephones to railroad trains. One of the largest and most powerful wireless electrical stations in the world will be erected at the Omaha shops within the next two months.

Dr. Frederick H. Millener, electrical expert, has been given carte blanche in the construction of this big wireless station, from which he will conduct expensive experiments.

Experiments will be conducted in wireless telegraphy and telephony and in remote control of machinery by wireless. Most important to the railroad will be the work in telephony.

Dr. Millener believes it will not be long before it will be possible to talk with a passenger on a train moving sixty miles an hour hundreds of miles from Omaha. This will permit railroad officials to keep in constant and close touch with all their trains and be able to communicate with them at any minute.

The doctor expects to have a wireless telephonic model working within the next six months.

Wireless telephony for trains will necessitate the placing of a copper wire along the track, this wire liberating wireless waves which are taken up only by instruments set for a particular wave.

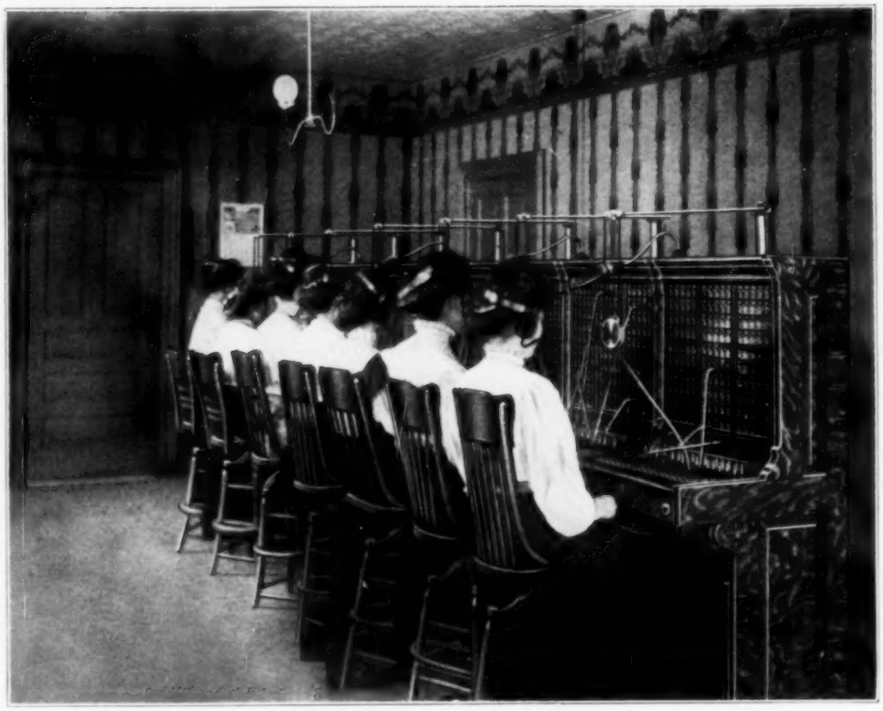
An Enterprising Independent Company

By Gifford Wheeling

LA PORTE, that charming little town nestling amongst the pretty lakes in La Porte county, Indiana, the credit of possessing more underground telephone construction than any other city of its size in the country. That indicates a telephone organization believing in modern ideas and up-to-date equipment. The office and operating force of the La Porte Telephone Company carry out the idea from the efficient operators to the oldest man in the service.

The company was organized in 1892 with fifty subscribers. Today there are exchanges at La Porte, Rolling Prairie, Westville, Union Mills, Hanna, Wanatah and La Crosse. There are now over 2,100 telephones in operation in La Porte county.

This company is strictly independent, in that it makes no exclusive contracts for toll lines, but connects with both Bell and independent. The main offices have been recently enlarged and are fitted with every convenience. The aim of this company, at all times, is to buy the very best and give the highest grade service possible. It believes the two go together. As a result the number of instruments installed is increasing daily.



The La Porte Company's Operating Room.

The La Porte Chief Operator and Her Charge.

In the last eight years the offices have twice been outgrown and eight operators are now required regularly to handle the business of this enterprising little city, on the Kellogg eight section switchboard. This board has now been in active service for eight years and the La Porte manager states that the company has practically no trouble from month to month. Last winter the company was singularly fortunate in the matter of outside line trouble, for while the terrific sleet storms that brought down so many line in Illinois, Indiana and Ohio, raged all around La Porte, its lines escaped almost entirely.

The present arrangement of the office and operating rooms is as near perfect as can be. The

switchboard room is large, with south exposure, plenty of light and ventilation. It is rectangular in shape, with the board at one end, extending the long way of the room. This allows ample space to get at the rear of the switchboard. The chief operator's desk faces the main board. It is situated between it and the toll desk which is at the opposite end of the room. Adjoining the operating room on the west is the distributing frame and arrester rack. A door at the opposite end of the exchange room opens into the office, which, however is shut off from view of the operators. This feature is a good one as there is less opportunity for operators on duty being disturbed by visitors in the office. The outer part of the office is separated by a wide counter across the room. This counter on the office side is fitted with shelves for record books, drawers, etc. It is large enough for the convenient perusal of maps and papers. The outer room is fitted with chairs for callers while back of this is the rest room for the operators.

Removal of Telephone Too Great Punishment

The Supreme Court of Iowa has ordered the telephone company in that state to restore a telephone which the company had taken out for the reason that the subscriber had been guilty of two telephone crimes. He had exceeded the bounds of propriety in expressing his opinion of the operator's attentiveness and efficiency, and he had made a habit of listening to conversations carried on by other subscribers on the same line. The New York *Times*, commenting editorially on this decision, states:

"Telephone companies, for the sufficient reason that each of their subscribers is to a considerable degree at the mercy of all the others, have from the beginning of their operations, claimed and exercised the right to censor communications passing over the wires and to fix on verbal liberties certain limitations, the violation of which would be punished by the removal of the offending patron's telephone and the refusal ever to restore it. The power thus assumed has, so far as we know, never been abused, and there is general acquiescence in the determination of the companies thus to guard the sensitive ears of employes and subscribers from profane, indecent, or too discourteous language.

"This more than fairly satisfactory situation has been rudely disturbed by a decision just rendered by the Iowa Supreme Court. It seems that a resident of that state had been guilty of two telephone crimes—he had exceeded the bounds of propriety in expressing his opinion of 'central's' attentiveness and efficiency, and he had made a habit of listening to the conversations carried on by other subscribers. That he had been guilty of both these offences is shown by the fact that after his telephone was taken out he promised to mend his manners and curb his curiosity if it were put back. The company, however, was inexorable, so the man sued for the restoration of his service. The court of first instance decided in his favor, and the company's appeal from that decision has failed.

"The grounds for holding that the company had exceeded its power are not stated in the dispatches at hand, but presumably they had to do with a disproportion between offense and penalty. In these days permanent deprivation of telephone service would be a serious disablement for carrying on the ordinary businesses and pleasures of life—a punishment evidently not to be inflicted for light cause or to be prolonged, especially by a common carrier, beyond the period required for ending the evil on which the action was taken. Anyhow, the too eloquent Iowan is to have his telephone back, and telephone companies all over the country will have to bear his case in mind when they undertake the disciplining of their subscribers. A moderate and reasonable exercise of the censoring power doubtless is still permitted. At least it is to be hoped so."

Reducing Alternating Inductive Disturbances

An article by Martin Hochstadter in the *Elektrotechnische Zeitschrift* deals with means for protecting the subscriber's station from the disturbances that may be produced in a telephone circuit by the electric or magnetic inductive influence of neighboring alternating circuits; or rather for reducing the effect of such disturbance to a minimum. A loud hum is usually heard in the telephone, of a pitch corresponding to the frequency of the alternating current in the neighboring wire. The loudness of this hum may be so great as to make telephonic conversation impossible, while even a comparatively faint hum may give rise to inconvenience, and the ordinary method of getting rid of such disturbance is by the transposition of wires. Either the telephone wires or the electric lighting wires, or both sets, may be transposed for this purpose; but the telephone wires are usually transposed, being the lighter and easier to manipulate. This method means overhauling the line, and may be troublesome to carry out. Moreover, there may be conditions under which transposition of the wires is insufficient to remove the disturbance. The article suggests two plans for reducing the disturbance, without any necessary change in the line wires.

One plan is to insert a very small condenser—say, of 0.05 microfarad—in the receing telephone circuit. This condenser would offer a relatively high reactance to the low frequency of the electric lighting circuit, and a much lower reactance to the frequencies of telephonic operation. Consequently, the voice currents would be diminished to some extent by the condenser, but the induced low frequency disturbances would be reduced much more. The other plan is to bridge the primary of an induction coil across the telephone circuit, and to connect the secondary to the receiver terminals through a suitable resistance in such a manner that the low frequency induced disturbance current may not only be diverted across the telephone line through the primary, but that its inductive action in the secondary may be opposed in the telephone receiver to the direct action producing the hum therein. Of course, the voice currents will also leak across the telephone circuit through the induction coil primary to some extent, but not nearly so much as the low frequency disturbing current. By means of either, or both, of these methods operating conditions may be restored to the telephone line.

Chicago Lists Telephone Stocks

The Chicago Stock Exchange has added the securities of the American Telephone and Telegraph Company to the regular trading list, beginning August 11. It is intended that Chicago shall furnish the market for the western territory, and if the proportion of business in these securities formerly sent to the eastern exchanges is transacted here it will mean a big thing in the way of new business for the local exchange.

The Michigan State Telephone Company has also agreed to list its stocks and bonds on the Chicago exchange.

Of Interest to the Trade

Self Restored Magneto Line Signal

The Western Electric Company has recently introduced an improved form of self-restored line signal and associated jack which overcomes many of the objectionable features that are inherent in those types which employ a form of drop shutter for a signal. This new piece of apparatus is known as the No. 2 combined jack and signal. Figure 1 shows a strip of five of these.

The signal consists of an indestructible steel ball which is mounted on a pivot. The upper half of this ball is covered with a black enamel and the lower half with red enamel. When in an inoperative position only the black surface of the ball shows through the opening of the face-plate and when in an operative position only the red surface of the signal ball is in view. This steel ball is counterbalanced in such a way that when the armature is attracted the ball is allowed to revolve through nearly 180 degrees. The signal is restored to its normal position by the act of plugging in to answer a call. The plug when inserted in the jack acts directly against a lever which engages a projecting lug on the target which causes it to revolve back into its normal position.

A few of the novel features of this piece of apparatus are as follows:

The red spherical target which is displayed when the signal is operated resembles the lamp signal of the central battery system and almost equals it in signaling qualities.

Due to the fact that the spherical target of the signal extends a portion of its surface through the face plate it can be easily seen from the side as well as from the front of the switchboard.

On account of this signal ball being a smooth spherical shape it avoids interference with the operator's cords and injury to the operator's hands or clothing.

Since the signal ball is made of punched steel any amount of impact with the operator's plugs will not injure the target or interfere with its adjustment or render it inoperative.

Fig. 2. Beginning to Remove Coil.

The restoring mechanism and all of those parts which are subject to injury from impact with the operator's plugs are placed back of the face-plate out of the way of injury.

The surface of this spherical target is covered with an indestructible enamel which will stand any amount of impact with the operator's plugs. Especial attention has been given to the night-alarm contacts. This circuit is completed by means of a pair of flexible German silver springs having pure platinum contacts. These springs are so placed that they are positive in action, not subjected to mechanical injury and are accessible for inspection and adjustment.

These night-alarm springs are shown in Fig. 1.

It will be noted from Figs. 2 and 3 that in order to remove the coil it is not necessary to break any wire or clip connections. This is accomplished by simply removing one screw. In removing a coil the fixed relation of these parts which maintain the adjustment of the signal are in no way disturbed.

These signals are furnished with coils of different resistances. All coils are interchangeable.

All coils are wound with black enamel insulated wire. This insulation is less affected by heat than silk, which is ordinarily employed for this purpose and also its insulation properties hold up better where there is an excessive amount of humidity.

These signals are provided with a small rectangular type of indicator which audibly and visually receives signals from the subscriber after the spherical target has been operated. This feature is extremely desirable on non-selective party lines on which code ringing is employed.

The No. 2 combined jack and signal is furnished on individual mounting strips and also on strips with five.

The jacks that are associated with these signals are regularly

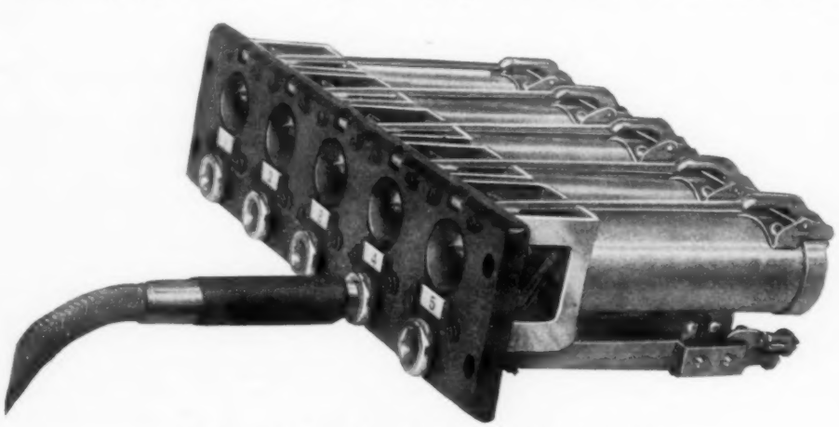


Fig. 1. Strip of Five No. 2 Combined Jacks and Signals.

made up, having a single break contact for ordinary lines and double break contacts for bridging toll lines. The signal is also made up with an audible code ringing attachment which consists of a relay type of contact that closes a local bell circuit each time that a code signaling impulse is received.

It is claimed that the new signal has met with marked success and satisfaction wherever installed.

The resemblance of this signal to the line lamp of a common-battery switchboard gives considerable advantage in the ease with which operators become accustomed to its action, enabling their transfer from one type of board to the other without loss of efficiency. The fact that it cannot be thrown accidentally also marks its superiority over the ordinary type of drop.

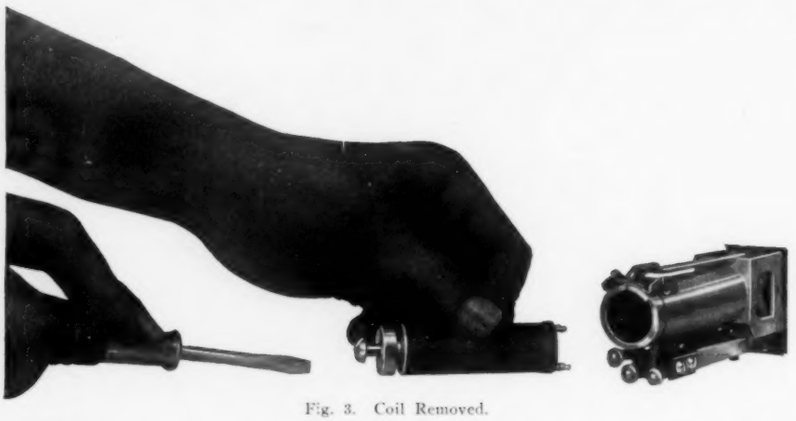


Fig. 3. Coil Removed.

Another American Invasion

The Chinese Empire is developing slowly but surely the spirit of commercial enterprise from which heretofore it has always seemed immune. The latest phase of the new progressive spirit in China is shown in the decision of the government officials to provide a modern telephone system for the capital city of Pekin. It is considered a striking victory for American methods and products that the Chinese have turned to this country for their new telephone equipment. In the face of competition from all the largest manufacturers in the world, an American firm, the Western Electric Company, has landed the order.

The New York Tribune in its issue of Saturday, August 7th, had an interesting account under the heading "Telephones for China."

The story read:

After February 3, 1910, the Chinese of Peking will shout their monosyllables through telephones of American construction. The Chinese government has just signed a contract with the Western Electric Company of this city for the installation of a complete telephone system at a cost of $150,000. This contract was awarded after two years of bitter competition with manufacturers from all over the world, who saw the significance of the introduction of telephones into China, where at present only two thousand instruments are to be found in the whole empire.

O. D. Street, telephone sales manager of the Western Electric Company, said a commission was appointed by the Chinese government two years ago to study the telephone systems of the world.

"They came here," he said, "and we showed them over the New York Telephone Company and over our own shops. They went back to China and we heard nothing more from them. We sent an emissary over there last autumn, and while he was there the emperor and empress dowager died, and nothing was done about the telephone contract. We kept up our efforts, however, and we received a cable message yesterday from our agents in China, saying that the government had signed the contract.

"We shall begin work at once on the equipment, which will include a power plant and reserve plant, 350,000 feet of lead covered cable for aerial and underground construction, and two common battery switchboards of the most modern type, such as are used in this city. Each board will have a capacity of ten thousand lines, but we shall set up only 2,500 lines at first. The work will be under the direction of two experts from this office. Workmen will be drawn from our offices in Japan, Berlin and Paris. We shall use a large number of Chinese in constructing the plant and we shall teach employes of the government how to operate and construct the lines.

"The Chinese have awakened to the possibilities of modern inventions, and the outlook is very bright. The contract for Peking is only a preliminary one. The government will operate the telephones for the benefit of all residents of the city. Later contracts will be awarded for Canton, Hankow and Tie-Tsin. In 1930 it is estimated that there will be a telephone for every five persons in this country. If China has one telephone for every one hundred persons at that time it will have cost her $1,000,000,000. At present there are only two thousand antiquated telephones in use in the whole empire, and most of them are in the foreign settlements."

One reason that led the Chinese government to award this contract to the Western Electric Company was the remarkable feat last autumn when the company manufactured, transported and set up the Paris telephone exchange—which was destroyed by fire—in less than sixty days.

Insulating Transformer for Telephone Lines

An insulating transformer for use on telephone lines has recently been placed on the market, whose purpose is to safeguard the users of telephones from the dangers of high voltages due either to induction or accidental contact between telephone and power lines, where these lines are on the same pole, or upon a parallel adjacent line of poles; and to improve telephone service by removal of the ordinary small ground gap carbon arrester from direct connection with the line, as well as improvement through better insulation by removing the interior wiring, instrument, batteries, etc., from direct connection with the line.

The high frequency talking currents are transformed with small loss, while the magnetizing current, which must be supplied by the ringing generator, is very small. Tests show that the magnetizing current taken by this transformer is about half the current passed by a standard 1,000 ohm bell.

The best protection is afforded when it is installed with a combined switch, fuse and lightning arrester. This combination is claimed to afford the greatest safety to both the telephone instruments and the user, even in the most extreme cases when the telephone lines come in actual contact with a high tension power circuit.

An adjustable gap arrester is connected between the telephone lines and ground, the function of this arrester being to take care of lightning discharges and in case of actual contact with high tension lines to arc over and blow the fuse, thus disconnecting the transformer and telephones from the line. Should a ground occur on the adjacent high tension line, the voltage induced on the telephone line will not materially interfere with the service, provided the line is sufficiently

well insulated. The adjustable air gap is set just beyond the point where this induced voltage will arc across.

Tests on a 30,000 volt transmission line in actual operation, it is said, showed that a ground on the one phase of the transmission system induced a potential on the telephone line of approximately 7,000 volts, measured between telephone line and earth. Notwithstanding this high induced voltage on the telephone line, it was possible to use the telephone when the transformer was installed. The line was somewhat noisier than under normal conditions, but not so noisy as to prevent comprehensive conversation. The General Electric Company is the maker of this device.

Pole Preservative Experiments

The unpleasant discovery that telegraph poles impregnated with copper sulphate by the Boucherie process are so readily attacked by fungi that in some districts they last only eight or ten years, has led the Austrian government telegaph bureau to institute experiments in the preservative action of fluorides. In the preliminary experiments air-dried poles were saturated with solutions of acid zinc fluoride containing a little free hydrofluoric acid. After two years' service from 80 to 100 per cent of these poles showed a surface absolutely intact, while of the poles treated with copper sulphate, after two years' service, only 50 per cent remained free from fungi and 10 per cent were badly rotted. In subsequent experiments on a larger scale the poles were impregnated with acid zinc fluoride both by steeping and by hydrostatic pressure. Analysis of the water which drained from the poles showed that all of the free acid and a large part of the loosely combined acid had been absorbed by the wood.

An Interesting Exhibit

A notable feature of the Alaska-Yukon-Pacific exposition at Seattle is a comprehensive exhibit in Machinery Hall of different kinds and sizes of wire and wire products made by John A. Roebling's Sons Company.

The changes undergone by metals in the production of wire are shown by a display in regular order of iron ore, pig iron, ingots, steel billets, rolled rods and drawn wire; the samples of wire beginning with the coarser sizes and running down to a diameter of 1/1000 of an inch.

In contrast with the delicate films of wire there are displayed many samples of large wire ropes and full size sections of the supporting cables of the Brooklyn bridge, the Williamsburg bridge and Manhattan bridge, in all of which Roebling wire is used.

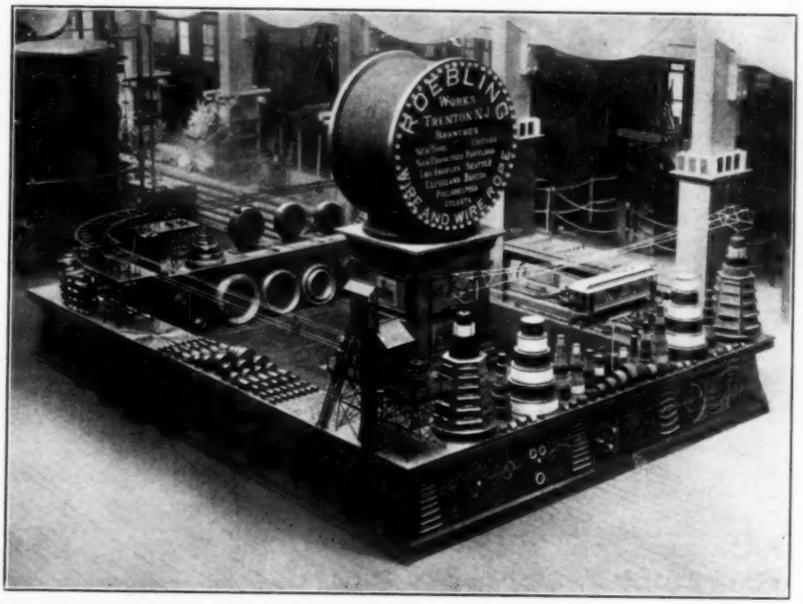
There is a complete exhibit of electrical wires and cables, ranging from the finest magnet wire to the largest lead covered cables.

Different sections of trolley wire are also shown, while catenary construction is graphically illustrated by a model over-head span with a miniature trolley car beneath.

A reel of wire rope seven feet in diameter and mounted upon a pedestal seven feet high, occupies the center space of the exhibit. An even hundred electric lights with frosted globes are placed around the circumferences of two sides of the reel, which revolves continuously upon its pedestal.

A model tramway which transports miniature buckets loaded with shot, is also shown in motion, both the reel and tramway being electrically operated.

The exhibit which is located in Machinery Hall was planned by the engineering department of the Roebling company and all the mechanical work necessary to prepare it ready for installation was done at the company's works.



The Roebling Exhibit at Seattle.

Telephone Directory Advertising

Telephone directory publicity has come to be a factor of no little importance in the telephone business and a real power in the commercial world.

The government census shows that the American family averages 4.6 persons, and the average number of people who use every business telephone is greater than this, as any business man knows. An average of five users for every telephone is certainly a conservative estimate. In fact the circulation is more nearly universal—for who does not use the telephone, either his own, a neighbor's, or a public station, at some time during the year? What more effective means of reaching the public by a single publication could be devised? The telephone directory is everywhere, it is always present, and has practically supplanted all other directories for the prime reason that it is kept up to date. It is easy to see how a book like this, constantly revised and circulated so generally must naturally be used for all purposes where an accurate guide is requirel.

Business men in all lines have come to recognize the telephone as one of the open doors through which business is to come and are giving more and more attention to telephone trade. One of the best arguments presented in favor of street car advertising is that it reaches the buyers on their way to market, thus bringing to their attention some article which they may need. In these

days of ordering by telephone the telephone directory is the last chance the advertiser has to reach the mind of the intending purchaser before the telephone call is put in. Side by side with the advertisement is the means of making the sale.

The telephone directory is practically unlimited in value. It is good to advertise anything. It has no dead circulation. It is on duty morning, noon and night, and every day of the year. The encyclopedia and Bible get duty, but the telephone directory is in use all the time. From the time the telephone is installed in any home or business house its use becomes constant. The new telephone subscriber usually makes a minute examination of the book and practically all users examine carefully all new issues when they appear. This in addition to the steady daily use of the books.

From the nature of the telephone it follows that the class of consumers reached by telephone directory advertising is the very best. The telephone is used in the homes of people of wealth or at least moderate means—those who have the money to spend and who demand the high-class manufactured goods which now form the bulk of advertising commodities. The newspaper and magazines go largely into the hands of people unable to buy and often without the power to appreciate good goods. The telephone lists are used everywhere by retail merchants to circularize first-class goods, being in itself proof that the telephone directory contains the names of, and is, therefore, used by the best buying people who want and can afford to buy first-class goods are the people who demand and can afford the telephone.—*Pioneer Monthly Bulletin.*

Telephone Invention

Unquestionably the highest achievement in the electrical transmission of intelligence is the speaking telephone. This comes home to us, for we all use it, and any can use it. It both talks and hears; and accomplishes the functions of both ear and vocal organs by a mechanism actually simpler than that with which the human being is endowed for like purposes. On the Fourth of July in the Centennial year, 1876, there was not a single telephone in commercial use anywhere, but now where are they not? The telephone was patented in March, 1876, and is, therefore, little more than thirty years old; yet it has utterly transformed methods of transacting business. By the last annual report of the American Telephone and Telegraph Company we find that, in the year 1907, the number of exchange connections for Bell telephones alone was about five thousand eight hundred and thirty-eight millions; or, a daily number of upwards of eighteen millions.

I have referred to the way in which each pioneer invention invariably proves to be the forerunner of, and gives rise to, a multitude of improvements in subsidiary inventions. The telephone has been no exception to this experience. As I have said, it is a little over thirty years since the telephone was invented, yet within that period of time, up to December 31, 1908, there have been granted in round numbers fourteen hundred and sixteen United States patents for telephones, and seven thousand and eighty more for switchboards, cables, bells, signal apparatus, protectors and other telephone appliances, all directly traceable to the parent invention. I cannot leave this part of the subject without a word on the multiple switchboard, an invention which, judging by its results, may be regarded in the field of telephony as second only to the telephone itself. Over twelve hundred United States patents have been issued for multiple switchboards and supposed improvements relating to it. It is this invention that has made telephone exchange communication on a large scale possible and practical, and, while doing this, it has at the same time operated to improve, cheapen and quicken the service. It has been estimated that by employing the multiple switchboard, a saving of ten seconds for each operation of bringing two sub-stations into communication is well within the facts. This may at first thought be regarded as an insignificant economy, but when we take into account that it is to be multiplied by the number of switch connections effected every day throughout the year, it is insignificant no longer. A calculation I have made, based upon the foregoing statement of the number of exchange connections made per day and per year in 1907 and assuming that but one-half of the total number were made by means of multiple switchboards, shows that the time saved, for the people of the United States who use the telephone, in a single year, by the availability of the multiple board, reaches the stupendous amount of 337,847 days, or more than 928 years. —*Thomas D. Lockwood, in the Telephone News.*

New Western Electric Quarters at Dallas

The Dallas house of the Western Electric Company recently moved into its new quarters in its own building at Pacific and Evay streets. The new house is a three-story and full-basement model structure, equipped with a 25,000 gallon tank to supply the fire protection apparatus.

The Western Electric Company has been in Dallas two years, but during this time business has increased to such an extent that the old quarters were found inadequate, and as a result this new structure, costing approximately $100,000, has been built. In this building, which acts as a storehouse and contains the offices of the company, is also included a large repair shop, to take care of the ordinary repairs of the apparatus handled by the company. This is one of the main features of the Dallas house, as they will give the same service there as is given in the other large houses of the company.

Employment will be given to about 125 men, which is an increase of 50 per cent over those formerly employed by the company.

One of the main points in the building of the new warehouse has been the convenient location of the transportation facilities. There is ample trackage lying along the building to take care of all southwestern shipments, and this will add greatly to the prompt handling of orders.

Heretofore the Western Electric Company occupied offices down town and leased the Fulton Bag and Cotton Mill building near the Union depot as a warehouse.

New Automatic Contract

Bucyrus, Ohio, is the latest convert to the system of automatic telephoning. Construction work on the new plant will be started during the winter, and is to be completed by next May. The entire system will be reconstructed and remodeled at a cost of $75,000. There will be 850 straight lines and 200 party lines installed.

An interesting development of the local telephone situation is that the Bucyrus papers are all heartily in favor of the change to automatic apparatus.

The officers of the Bucyrus company are John A.

Chesney, president; Herbert Blair, vice-president; Albert G. Stoltz, secretary, and C. H. Weinbar, manager. The directors are William Miller, Benjamin Shearer and John T. Wentz.

Mr. William J. Tewksbury has taken the position of general shop superintendent with the Automatic Electric Company. Mr. Tewksbury has for more than eight years had experience as machinist, foreman and shop superintendent, embracing the employment by the Diamond Sewing Machine Company, Adams and Westlake and the Chicago Stamping Company, up till 1895, when he entered the employ of the Western Electric Company in its telephone department. He was for more than ten years chief inspector of the entire output of the Chicago factory, and in March, 1908, he was made general foreman of the machine and assembling departments.

He will have full charge of the mechanical end of manufacturing and inspecting the output of the Automatic Electric Company. He is regarded as one of the most experienced and best equipped factory superintendents in the United States.

Arguments for Competition

The recent filing with the St. Louis city authorities of the annual reports of the Kinloch (Independent) Telephone Company and the Bell Telephone Company of Missouri shows that, in the eight years since the commencement of competition in that city, the number of stations has been increased from 3,500 to 80,000.

The large number of subscribers the Kinloch company has, taken with the large number the Bell has at the present time, indicates a very great increase in telephone patronage in St. Louis and vicinity. Ten years ago there were few names (subscribers), and telephone service was very poor. This is a case of competition making business boom for both sides in the business rivalry. Today fully 75 per cent of the homes have telephones, and the number is increasing every week.

The attorney-general of Ohio recently expressed strong views on the fruits of monopoly. April 3, 1907, a contract was signed by the Central Union Bell and Marion County Independent companies of Ohio.

On October 1 the Marion County Company announced a raise in rates of approximately 40 per cent.

The public, however, refused to be "assimilated," and its manager, under oath, is compelled to admit that, whereas under competition the number of users of telephones increased from the day competition began until the hour when it was strangled, yet, when competition ended, the number of users decreased, and has steadily decreased until the hour he made this statement.

And so here we have the usual fruits of monopoly—high prices and few consumers.

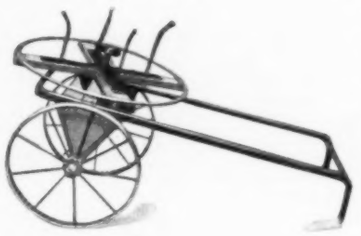
Casco Bay Gets Wireless

The islands of Casco bay, which heretofore have been isolated so far as telephone connection is concerned, have opened the first commercial wireless telephone system in the world. Four out of thirty stations that are to connect the islands with Portland, Maine, have just been opened. Owing to the rocky bottom and swift tides in the bay it has been impossible to lay wires for the ordinary telephone system.

A new tuning apparatus was used, which, it is said, will make wireless telephoning more private than the wire system.

Wasson Opening Canadian Factory

B. F. Wasson, of Clinton, Ill., called at TELEPHONE ENGINEER'S offices on his return from Canada. He reports a remarkable demand for the Wasson reel, and finds prospects for the next year very bright. While in Canada Mr. Wasson arranged with J. F. Suttie to take charge of the new Canadian factory of the Wasson Reel Company at Winnipeg. Mr. Suttie was formerly traffic manager for the Canadian Pacific Railroad.



Government Telephone for Uruguay

The Uruguayan government has presented a bill to authorize the sum of $1,500,000 for the construction of a state telephone system. There are already two companies working telephone systems in Uruguay, and the present intention of the government is to compete with these, and not to acquire them. It is proposed to issue a loan for the amount mentioned, bearing interest at five per cent.

The House of Johann

H. A. Johann and Company are now located at Obar, New Mexico, or at least H. A. Johann himself is. O. R. Johann is in Minneapolis, where he, as well as his brother in the southwest, is taking care of all the business he can handle in the line of engineering and installing, making plans, specifications and estimates, and the other several activities that the friends of Johann and Johann, erstwhile of Pekin, Illinois, are familiar with.

A Correction

Through error it was reported in the August number of TELEPHONE ENGINEER that the name of the Western Telephone Manufacturing Company had been changed. The company is still known by its old name, and has its factory and offices on Curtis street, Chicago. C. L. Johnson, however, is no longer associated with the concern.

Tenders are being invited by parties in an Asiatic city for the installation of a telephone system for 1,000 subscribers, the line to have long-distance connections. The contract will be closed by September 30, 1909. As this is a new field in this respect, an American consular officer suggests that interested firms should take steps toward securing a part of the business.—Bureau of Manufactures, Washington, D. C., File No. 3,779.

J. C. Murray, district sales engineer for the Kellogg Switchboard & Supply Company, of Chicago, reports the sale of switchboard and telephones to the Consolidated Telephone Company, at Clarksburg, West Virginia. This contract is a very important one, and was awarded strictly upon merit. It guarantees future earning power, as well as successful resistance to future competitive attacks.

Brevities of the Business.

PERSONAL NOTES.

William Henry McDonough, still of New York, blew into Telephone Engineer's office recently and staid for several hours. "Mac" inquired about his old friends and wanted to be remembered to all of them. And in passing, if this sounds like a country newspaper item, forget it, because you can't express it in any other way. McDonough has been all over Europe since we last met and then there was some chatter of mutual interest that made the visit most enjoyable.

Stanley Lichty has so far recovered that he is able, at this present moment, to sit up and take notice. The gray hairs in his head are turning back to the color of earlier days and there is a ring in his laughter that was preceded some few months back by something that sounded like a rasping. Some people are born luckier than others. It is better to be a retired capitalist and the editor of a county telephone system.

O. P. Noakes, Iola, Kans., has been appointed manager of the Humboldt Telephone Company, Humboldt, Kans.

Charles B. Lynn, formerly manager of the People's Home Telephone Company, Leavenworth, Kans., has been appointed manager of the Independent Telephone Company, Atlanta, Ga.

E. H. Dacey, Scranton, Pa., has been appointed manager of the Home Telephone Company, Champaign, Ill., to succeed Lon Lee, who has acted in this capacity for the past year, but resigns to take up another line of work.

L. W. Fielding has resigned as manager of the Home Telephone Company, Jonesboro, Ark.

C. C. Campbell has been appointed manager of the Colorado Telephone Company's exchange at Sterling, Colo.

William A. Patton has been promoted from the position of manager to that of secretary of the United Telephone Company with headquarters at Bluffton, Ind.

Walter Wilcox has been appointed general manager of the Home Telephone Company, Portland, Ore.

E. W. Carter, who has for some time past been in charge of the Boston office of the Hoyt Electrical Instrument Works, will hereafter be connected with the factory, and A. K. Brown will succeed him in charge of the Boston office. Mr. Brown has been identified with Hoyt instruments for a considerable time, and is therefore well equipped for his new position.

NEW TELEPHONE COMPANIES.

Marked Tree, Ark.—The Marked Tree Telephone Company has been incorporated with the following officers: President, E. W. Ritter; vice-president, W. L. Pfleger; secretary treasurer and manager, W. B. Avers.

Lake City, Ark.—The People's Telephone Company has been incorporated by P. J. Springer, C. S. Moore, W. S. Martin and others.

Fordyce, Ark.—The Southern Telephone Company has been incorporated with a capital stock of $1,000,000. The incorporators are A. B. Banks, J. W. Lee, H. C. Couch and others.

Frederica, Del.—The Frederica Telephone Company has been incorporated by John S. Campes, William F. Hoey and George W. Spurry, with a capital stock of $5,000.

Gibson City, Ill.—The Drummers Telephone Company has been incorporated with a capital stock of $5,000 by D. A. Taylor, W. E. Crowe and W. S. Day.

Downs, Ill.—The Old Town Telephone Company has been incorporated by R. H. Roadman, John McBarnes, and Z. T. Strayer.

Port Byron, Ill.—The Port Byron Telephone Company has been organized at this place and the following officers elected: President, A. H. Brewster; secretary, A. Saddoris; treasurer, E. M. Rogers.

Westfield, Ill.—The Westfield Telephone Company has been incorporated with a capital stock of $2,500. The incorporators are J. J. Hinkley, E. E. Robbins, John Hornbrook and Jackson Hardin.

Warrington, Ill.—Articles of incorporation have been filed for the Warrington Telephone Company; capital stock, $6,000. The directors are W. J. Kennedy, G. H. Blakely, George Johnson.

Denison, Iowa.—The East Boyer Telephone Company has been incorporated with a capital stock of $5,000 by Harlow Chapman, Tracy Chapman, James North, Davivd Bell, and others.

Anthon, Ia.—A local telephone company was recently organized with the following officers: President, S. R. Lucas; vice-president Dr. W. L. Stillman; secretary and treasurer, M. L. Bryant.

Flat Lick, Ky.—The Flat Lick and Jarvis Telephone Company has been organized with Thomas L. Davis manager.

Bolts Fork, Ky.—The John Hazlett Telephone Company has been incorporated by V. B. Shortridge, D. L. Rucker, Lon Ross, W. H. Hogan and J. W. Woods.

Mayfield, Ky.—The West Mayfield Telephone Company has been incorporated; capital stock, $4,000. The incorporators are Dr. W. M. Rozzell, Noblin Rozzell and others.

Kingsley, Mich.—The East Paradise Telephone Company has been organized by the farmers of Paradise township. The officers of the company are: President, Edwin Clark; secretary, Bert Smith; treasurer, V. W. Bancroft.

Maple City, Mich.—The Cleveland Valley Telephone Company has been organized; capital stock, $2,000.

Easton, Minn.—The Easton Telephone Company has been incorporated with a capital stock of $1,200 by William Sippel, C. Bachtle, W. A. Cusick, W. C. Achemer, T. Gaffey and B. M. Armstrong.

Kellogg, Minn.—The Kellogg Telephone Company has been incorporated with a capital stock of $5,000 by Martin Costello, M. K. Wolfe, Charles Gonjnnagel, L. O. Cooke and others.

Louisville, Miss.—The Winston Telephone Company has been incorporated by G. W. Jarvis, J. D. Fulton and others; capital stock, $10,000.

Erickson, Nebr.—The Lisle Telephone Company has been organized in the northwestern part of the county and the officers are as follows: President, J. S. Harris; vice president, A. E. Bentley; secretary, A. J. Smith; treasurer, W. H. Meyer; directors, F. P. Heston, Jr., S. T. Anderson, Harry Grout.

Great Falls, Mont.—The Great Falls Automatic Telephone Company has been incorporated with a capital stock of $500,000; president, F. R. Vandeputte.

Dorsey, Nebr.—The Dorsey Independent Telephone Company has been organized with a capital stock of $3,000 by D. D. Miles, J. A. Brady, B. W. Postalwait, and others.

Edgar, Nebr.—The Edgar Home Telephone Company has been incorporated; capital stock, $100,000 and the directors are as follows: H. C. Hart, G. H. Avery and N. Tompson.

Burlington, N. D.—The Burlington Farmers' Telephone Company has been incorporated by William J. Kluver, Henry Parrie, Daniel Baker and others; capital stock $25,000.

Buchanan, N. D.—The Buchanan Telephone Company has been organized and application has been made for a $25,000 charter. The officers are; President, J. A. Buchanan; vice president, James Lees; secretary, Edward Isaacs; treasurer, F. H. Keeler.

Hellwig, N. D.—The Union Telephone Company has been incorporated with a capital stock of $15,000, and the following are the officers: President, John Meidinger; secretary, B. C. Hellwig; treasurer, John Beglau.

LaMoure, N. D.—The Oakes Junction Independent Telephone Company has been incorporated by C. A. Malm, Aug. Faruenburg and G. J. Schmidt.

Camden, N. J.—The Railway Building & Operating Company has been incorporated by C. T. Leland and C. W. Rambo with a capital stock of $125,000 for the purpose of constructing telephone and telegraph lines.

Alder Creek, N. Y.—The Alder Creek Telephone Company has been incorporated, with a capital stock of $2,000. The incorporators are Thomas J. Jones, Boonville, N. Y., Willis Wheeler, John I. Morris, Alder Creek.

McDonough, N. Y.—Christopher Yaw, George Hall and Samuel Beckwith of Concinnatus, N. Y., have organized the Northern German and Pacther Telephone Company.

Minot, N. D.—The Williams County Farmers' Mutual Telephone Company has been incorporated with a capital stock of $10,000. The incorporators are W. W. Keitner, W. W. Wilde, Abraham Miller.

Merricourt, N. D.—The Dickey County Telephone Company has been organized with J. W. Crabtree, C. W. Sullivan and M. M. Cook as directors.

Arcadia, Ohio.—The Arcadia Mutual Telephone Company has been incorporated with a capital stock of $10,000. The incorporators are A. L. Anderson, Sherman Huffman, W. H. Dillery, E. E. Bish and G. W. Dick.

Inola, Okla.—The Inola Telephone Company has been in-

corporated; capital stock, $2,000. The incorporators are M. J. Cameron, J. E. Hathaway, John H. Ross, A. K. Critchen, of Inola, and W. A. Crockett of Choteau.

MEDEA, OKLA.—The Medea Telephone Company has been incorporated by S. L. Sheet, J. L. Horice and F. M. Gibson, of Fairbanks; capital stock, $2,500.

RIPLEY, OKLA.—The Olive Grove Telephone Company has been incorporated by J. B. Bennett, Harry Greer and W. F. Tietz.

STILLWATER, OKLA.—Articles of incorporation have been filed for the Payne County Rural Telephone Company with a capital stock of $15,000. The incorporators are H. A. Jones, O. W. Trigg and S. H. Stanley.

COWLINGTON, OKLA.—The Cowlington-Spiro Telephone Company has been organized; capital stock, $1,000. The officers are: President, T. L. Thrael, Cowlington; secretary, W. E. McGeown; treasurer, R. L. Rewine, Spiro.

ONTARIO, ORE.—The Ontario Citizens' and Independent Telephone Company has been organized; capital stock, $10,000.

PENDLETON, ORE.—The Holdman Telephone Company has been incorporated, with a capital stock of $3,000, by Fred L. McCrea, R. O. Earnhart, R. A. Bissinger.

WALDPORT, ORE.—Articles of incorporation have been filed for the Yachats Telephone Company. The capital stock is $2,500 and the incorporators are O. V. Hurt, W. M. Brooks and Silas Howell.

CHAMBERSBURG, PA.—The Garfield Telephone Company has been organized with the following officers: President, A. S. Thompson; secretary, Aaron Snoke; treasurer, John Ebersole.

STRASBURG, PA.—The Strasburg Telephone Company has been incorporated; capital stock, $10,000. H. B. Leaman of this place is treasurer.

HARRISBURG, PA.—A charter has been issued for the National Telephone and Telegraph Company. The company is capitalized at $10,000 and has for its purpose the extension of lines throughout the state and other states. The incorporators are Charles E. Wilson, Clarence L. Harper, F. R. Shattuck, Edwin M. Finletter, and Horace M. Schell, of Philadelphia. Mr. Harper is treasurer and has offices at 140 South Fourth street, Philadelphia, Pa.

LIMERICK, PA.—The Limerick Telephone Company has been incorporated by J. A. Tranley, William H. Weaver, W. E. Peterman, A. G. Fry, Levi Zeigler and others.

YELLOW HOUSE, PA.—Application will be made for charter for the Manatawney Rural Telephone Company. The company is capitalized at $5,000, and the officers are as follows: President, George H. Schearer, Yellow House; secretary, Walter S. Ludwig, Athol; treasurer, Mahlon E. Weidner, Earlville.

GREENSBORO, S. C.—A charter has been granted the Southeast Guilford Telephone Company; capital stock, $20,500. Among those interested are C. S. Gilmer, Greensboro; J. H. Bowman, Liberty; C. M. Bobb, Julian, and others.

BUTLER'S LANDING, TENN.—The Butler's Landing Home Telephone Company has been incorporated; capital stock, $6,000, and the incorporators are as follows: T. W. Roberts, V. B. Mayfield, J. A. Roberts, J. M. Lynch and W. B. Clark.

OBION, TENN.—Articles of incorporation have been filed for the Obion Telephone Company with a capital stock of $5,000. The incorporators are W. G. Reynolds, M. Y. McMurray, J. P. Adams, S. L. Caruthers and S. P. Harris.

WOODBURY, TENN.—The Home Telephone Company has been incorporated by Jesse Davenport, L. H. McCrary, J. P. Wood, Walter Hancock and others, with a capital stock of $5,000.

SAN ANTONIO, TEXAS.—The Blanco Road Telephone Company has been incorporated with a capital stock of $1,000 by R. F. Pipes, A. Seidel, Ganahl Walker and Nat M. Washer.

FARMVILLE, VA.—The Farmville Telephone Company has been organized with the following officers: President, R. E. Johns; secretary-treasurer, E. R. Booker; general manager, R. E. Johns, Jr.

FREDERICKS HALL, VA.—The Fredericks Hall Telephone Company has been incorporated with a capital stock of $5,000. The officers are: President, Edgar Marshall; vice-president, E. A. Ferrell; secretary-treasurer, J. H Crunk.

PIERRE, S. D.—The Pierre and Southeastern Telephone Company has been incorporated by Albert Gunderson, Frank B. Rowe and others, with a capital stock of $100,000.

HAPPY, TEXAS.—Articles of incorporation have been filed for the Happy Telephone Company; capital stock, $5,000.

VILASCO, TEXAS.—The Brazos Telephone Company has been incorporated by D. A. Todd, C. J. Mackey and L. T. Mackey; capital stock, $10,000.

WOODSTOCK, VT.—Articles of incorporation have been filed for the Woodstock Telephone Company; capital stock, $5,000.

UNDERWOOD, WASH.—The Underwood Telephone Company has been organized with the following officers: President, W. F. Cash; vice-president, Henry K. Love; secretary-treasurer, Hugh W. Hamlin.

MILAN, W. VA.—The South Fork Mutual Telephone Company has been incorporated by N. D. Wilson, N. G. Dasher and others of this place.

PENNSBORO, W. VA.—The North Bend and Southern Telephone Company has been incorporated; capital stock, $5,000.

WARWICK, W. VA.—The Marlinton and Cloverlick Mutual Telephone Company has been incorporated by John A. Beverage, Cloverlick; A. N. Barlo wand George W. Allen, Warwick, and others.

ALTO, WIS.—The Eastern Alto Telephone Company has been incorporated by William Smith, John Frericks, Garry Wellhouse and R. Kastein; capital stock, $4,000.

FOREST JUNCTION, WIS.—The Calumet Telephone Company has incorporated; capital stock, $3,500. The incorporators are William Hulkes and others.

COWLEY, ALTA., CAN.—The Farmers' Mutual Telephone Company has been organized with a capital stock of $5,000.

REGINA, SASK., CAN.—The Rose Plain Telephone Company has been organized.

REGINA, SASK., CAN.—The Central Rural Telephone Company has been incorporated to construct rural lines.

ELLISBORO, SASK., CAN.—The Ellisboro Rural Telephone Company has been incorporated.

FAIRVIEW, SASK., CAN.—The Fairview Farmers' Rural Telephone Company has been incorporated.

ROULEAU, SASK., CAN.—The Riverside Rural Telephone Company has been incorporated with principal place of business in this place.

ALLEN, SASK., CAN.—The Allen Rural Telephone Company has been organized with the following directors: W. F. Vauder, F. B. Williams, R. E. Beaver, M. Loran, W. E. Redick, Stanley Bowser, F. B. Doane.

DUNDURN, SASK., CAN.—The Wall Lake Rural Telephone Company has been incorporated.

MAPLE CREEK, SASK., CAN.—Articles of incorporation have been filed for the Bay Creek Telephone Company.

FINANCIAL ITEMS.

FAIRFIELD, ILL.—The People's Telephone Company of Southern Illinois has increased its capital stock from $10,000 to $20,000.

GENESEO, ILL.—The Geneseo Telephone Company has increased its capital stock from $2,500 to $10,000.

TAMPICO, ILL.—The Tampico Mutual Telephone Company will increase its capital stock from $6,000 to $10,000.

FRANKFORT, KY.—The East Tennessee Telephone Company has increased its capital stock from $1,000,000 to $5,000,000.

HARLAN, KY.—The capital stock of the Harlan Telephone Company has been increased from $4,000 to $5,000.

GLENDIVE, MONT.—The Eastern Montana Telephone Company has increased its capital stock from $15,000 to $60,000.

WEATHERFORD, OKLA.—The capital stock of the Farmers' Mutual Telephone Company has been increased from $2,500 to $10,000. It is the purpose of the company to install an exchange in this city and extend its lines into the adjoining counties.

CANADIAN, TEXAS.—The Canadian Long Distance Telephone Company has increased its capital stock from $10,000 to $20,000.

WISE, VA.—The Wise Telephone and Telegraph Company has amended its charter increasing its capital stock from $5,000 to $6,000.

HANOVER, PA.—The East Hanover Telephone Company has increased its capital stock from $5,000 to $10,000.

CHARLESTON, W. VA.—The Jefferson County Telephone Company's stock has been increased from $25,000 to $35,000.

HAWKINS, WIS.—The Hawkins Telephone Company has increased its capital stock from $1,200 to $2,000.

LARSEN, WIS.—The capital stock of the Larsen Telephone Company has been increased from $5,000 to $10,000.

EDMONDS, WIS.—The Independent Telephone Company has increased its capital from $5,000 to $10,000.

FRANCHISES ASKED AND GRANTED.

JONESBORO, ARK.—The Home Telephone Company of this place is seeking a franchise to enter Paragould.

EMPORIA, KAN.—An ordinance has been passed granting the Emporia Telephone Company a twenty-five year franchise in this city.

MARION, KAN.—The Marion Mutual Telephone Company

has been granted a new twenty-year franchise in this city, the work of construction to begin at once.

Ashland, Ky.—The John Hazlett Telephone Company has purchased a twenty-year franchise in this city.

Saline, Kan.—Frank Hageman was recently granted a franchise to construct and operate a telephone system in this place.

Chillicothe, Mo.—C. H. Surber, special agent for the Kansas City Long Distance Telephone Company, has asked for a twenty-year franchise for his company to pass its line through the city and to install stations.

Summit, N. D.—The Summit Rural Telephone Company has been granted a franchise to operate in this place.

Emmaus, Pa.—The Emmaus Telephone Company has been granted a thirty-year franchise to operate in this city.

Randolph, Vt.—G. A. Clough of the Home Telephone Company of this city has been granted a franchise to do business in Rutland.

Patterson, W. Va.—At a special meeting of the town council recently the Bell telephone company was granted a fifty-year franchise.

RATES.

Streator, Ill.—The Independent Telephone Company has asked for permission to increase its residence rates from $15 to $18 per year and its business rates from $27 to $30.

Kansas City, Mo.—An agreement has been reached between the Missouri and Kansas Telephone Company and the city placing the yearly rate for business telephones at $60 per annum and residence telephones at $36.

Asheville, N. C.—The Southern Bell Telephone Company has been granted the right to increase its rates in Asheville and Wilmington as follows: From $3 to $3.50 for unlimited duplex service; from $2.50 to $3 for unlimited residence service, and from $2 to $2.50 for residence lines limited to two parties.

Monticello, Ind.—An ordinance has been passed granting the Monticello Telephone Company the right to increase its residence rates to $1.50 per month and business rates to $2.50. The company agrees to install a central energy or common battery system and to keep the efficiency up to the standard set by the Town Board or the rates will revert to the old figures. The increase of rates will take place thirty days after the new system is thoroughly installed.

MISCELLANEOUS.

Flagstaff, Ariz.—The stock of the Flagstaff Mutual Telephone Company was recently taken over by the Arizona Overland Telephone Company.

Hiwassee, Ark.—The Hiwassee Telephone Company will extend its lines to Gravette, where an exchange will be installed.

Woody, Cal.—J. C. Rutledge of this place is interested in the construction of a telephone line from Glennville to Delano, via Woody, and will organize a company for this purpose.

Woodhull, Ill.—The Woodhull Village Telephone Company will reconstruct its system at an estimated cost of $1,900.

Virden, Ill.—The telephone exchange at this place has been purchased by Charles H. Snell of Girard, who will take possession about October 1.

Sac City, Iowa.—S. M. Elwood will reconstruct his telephone plant.

Rose Hill, Iowa.—The Oskaloosa Home Telephone Company will install a new switchboard in its exchange at this place.

Keokuk, Iowa.—The Mississippi Valley Telephone Company will make many improvements and extensions.

Marengo, Iowa.—The Marengo Telephone Company will install additional cable work.

Des Moines, Iowa.—The Mutual Telephone Company contemplates the expenditure of $25,000 in improvements, which will include the installation of a new switchboard at the suburb of Highland Park.

Winchester, Ind.—The Eastern Indiana Telephone Company will entirely rebuild its system and a new switchboard will be installed.

South Bend, Ind.—The South Bend Home Telephone Company will greatly extend its underground system.

Osage, Kan.—The Osage Telephone Company is planning a number of improvements in its system.

Scotsville, Kan.—The Home Telephone Company will construct a new exchange building.

Horn, Ky.—Robert B. Franklin and others are interested in the construction of a line from Horn to Rockhouse Creek, via Millstone.

Greentown, Ind.—The Greentown Telephone Exchange has been purchased by J. T. Deschon of New Richmond.

Stanton, Mich.—The Clifford Lake Telephone Company, recently organized, will construct a line from this city to Clifford Lake.

Jackson, Miss.—The Mississippi Home Telephone Company, recently incorporated, will at once begin the construction of its lines.

Mason City, Iowa.—The Western Electric Telephone Company has purchased the controlling interest in the Algona Telephone system, which has been reorganized and plans made for improving it.

Detroit, Mich.—A number of capitalists have organized the Detroit River Telephone Company to take over the property of the Interstate Long Distance Telephone Company, which is affiliated with the Home Telephone Company.

Flint, Mich.—B. W. Trafford, of Detroit, vice-president and general manager of the Michigan State Telephone Company, announces that the company will erect a $100,000 exchange building in this city, which will be ready for occupancy by January 1.

Detroit, Mich.—The Home Telephone Company has secured consent to issue an additional $2,750,000 in bonds, with the intention of enlarging its plant, notice for which has been filed in the city clerk's office.

Great Falls, Mont.—T. S. Lane, manager of the Independent Telephone Company, Butte, Mont., has arranged for the construction of a new exchange building in this city at an estimated cost of $25,000.

Culbertson, Mont.—The Montana Star Telephone Company will extend its line, work to begin as early as possible.

Hale, Mo.—The local telephone system has been purchased by W. W. Tracy of Shelbina, who will greatly improve the same.

Lincoln, Neb.—The Lincoln Telephone and Telegraph Company contemplates installing new equipment in its South Lincoln exchange.

Florence, Neb.—The Independent Telephone Company will erect a new exchange building in this city.

Fairbury, Neb.—The Fairbury Telephone Company will build three new copper metallic circuits between Fairbury and Beatrice and two additional circuits to Lincoln, which will greatly facilitate the handling of the company's business. The cost of the first is estimated at $10,000 and it is to be completed by October 1st.

Albany, N. Y.—The New York Telephone Company has taken over the Westchester division of the Hudson River Telephone Company, involving about 5,000 telephones, in Peekskill, Croton, Briarcliff and Haverstraw.

Rome' N. Y.—The Rome Home Telephone Company, recently bidden in by James S. Brailey, Jr., of Toledo, will be reconstructed and enlarged.

Crab Orchard, Neb.—The Crab Orchard Telephone Company has been purchased by the Nebraska Telephone Company for a consideration of $19,500.

Findlay, Ohio.—The Home Telephone Company of this city has been purchased by E. Bruce Myers; consideration, $30,000.

Columbus, Ohio.—Three-fourths of the stock of the London Home Telephone Company has been turned over to the Columbus Citizens' Telephone Company and the latter is now practically in control of the former, which it will at once proceed to put into first class shape. The exchange and lines will be reconstructed and it is quite probable that the exchange will be of the latest automatic type. The Columbus company is negotiating for the purchase of other companies.

Raleigh, N. C.—The Raleigh Telephone Company will make extensive improvements, including the installation of a new switchboard of 2,500 capacity. W. A. Wynne is manager of the company.

Hood River, Ore.—The Hood River Telephone Company contemplates the expenditure of $75,000 in the extension and improvement of its system.

Portland, Ore.—The Pacific Telephone and Telegraph Company has set aside an appropriation of $250,000 for the extension and improvement of its system in this city.

Fort Worth, Texas.—The Southwestern Telephone and Telegraph Company will erect a new exchange building in this city, also in San Antonio. A new switchboard will be installed in the latter city with a capacity of 9,600.

Texarkana, Texas.—A. C. Stuart of this city has been appointed receiver of the Texarkana Telephone Company.

Wise, Va.—L. M. Vanover, jr., manager of the Wise Telephone and Telegraph Company, is planning for extensive construction work in the near future.